PLASTIC SURGERY OF THE NOSE

INCLUDING RECONSTRUCTION OF WAR INJURIES
AND OF DEFORMITIES FROM
NEOPLASTIC, TRAUMATIC, RADIATION CONGENITAL, AND
OTHER CAUSES

(Revised Second Printing)

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PREFACE TO THE REVISED SECOND PRINTING

THE FIRST PRINTING of this book was a large one for a medical book and we were astonished at the rapidity with which it was bought out. Since then the number of rhinoplasties being done has increased greatly until they are frequent, standard procedures in most medical centers and in many major hospitals. It is possible that this is just the beginning

This Revised Second Printing is in response to a continuing and increasing demand for more copies with none available The question that we had to decide was whether to revise for a completely different edition or to undertake a reprinting with additions

On April 27 1965 we wrote the publisher as follows "We have gone over *Plastic Surgery of the Nose* several times during recent years with the idea of seeing what changes we could make. We have found that perhaps an illustration could be omitted here another added there a paragraph rephrased or changed here or there—but then the question always arises as to whether these would not be changes for revision rather than accomplishing any significant improvement.

"The difficulty in revising this book is that these operations are purely anatomical they had been completely developed when the book was written and they are being used unchanged now all over the world. The book is just as good and just as modern today as the day it first appeared. The only worthwhile addition since then is the sometimes use of some of the new synthetics (in lieu of cartilage or bone) for implantation purposes and we could cover this well in a single chapter It could be placed at the end of the book."

Mr Payne Thomas's concurrence and co-operation in this was immediate and forthright making early publication of this volume possible

It is to be expected that any resouceful surgeon will develop his own variations in technique One will use a chisel another an osteotome the third a saw Access incisions will differ as will some other details What *will* remain unchanging is the anatomy of the initial deformities the anatomy of the desired corrections and the basic steps of altering the framework to get from the first to the second These are the core of this book.

We hope that the readers are as pleased as we are with the appearance of this Revised Second Printing in an attractive format, and with the important addition of the new chapter on synthetic implants.

St Louis Missouri

J B B
F McD

PREFACE TO FIRST PRINTING

THIS BOOK DESCRIBES the operative procedures that, by personal use a experience we have found most practical in surgical reconstruction of nose Each operation is illustrated step-by step in drawings by Miss G trude Hance They have been reproduced clearly, in large size and in t colors a feature that is all too rare in books on operative surgery Th unusual drawings and the selected photographs of patients explain various deformities and their corrections more clearly than words.

Since this is intended as a practical clinical book and not as an encyc pedic compilation space is not taken up with outmoded operations more recent ones that we have not found essential Several of the procedu described were developed originally on our services in St. Louis and on senior author s service in Valley Forge General Hospital during Wo War II Some of these are published here for the first time No bibliogra is appended as it seems impossible to assign proper priority for every ope tion and all of its variations, and it has seemed best to leave this to cumulative index and to periodic reviews appearing in journals

The most widely known reference work in rhinoplastic surgery for ma years has been *Nasenplastik und sonstige Gesichtsplastik* by Profes Jacques Joseph of Berlin (published by C. Kabitsch in 1931) His ba technique for osteoplastic reduction of the nose is described here alc with the changes time has brought. Included in addition are newer portant tip operations building up the nose with L-shaped transplants bone and cartilage straightening twisted and deviated noses early and l care of fractures correction of cleft lip noses newer techniques of rep with skin grafts and flaps, treatment of radiation burns and carcinoma of free composite grafts from the ear the reconstruction of war injuries other operations

It has seemed indicated to introduce this kind of clinical operative gery of the nose that is inclusive of the whole field of requirement. In it have described the most practical approach to each problem as we h experienced it and have tried to answer as we go along the questions t have come up and been discussed over a long period of years with friends engaged in the work, and we have tried to make a composite ans of the many queries that have come from visitors students and youn surgeons

The demand for plastic surgery on the nose has been increasing people have become more aware of the worth while changes that are possil

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GENERAL CONSIDERATIONS

Chapter I

INTRODUCTION AND HISTORICAL NOTE

THE NOSE IS SUCH A noticeable feature and is subject to so much ridicule if unsightly or deformed there is little wonder that many people who have deformities seek improvement in their appearance Plastic and reconstructive surgery of the nose is required for many different lesions from total loss as in warfare and from other trauma and cancer to lesser deviations from normal that might be thought unnecessary of correction in general but that are the source of unhappiness to the patients.

If a normal nose is deformed by accident or disease it is desirable to try to restore the original shape Therefore if the nose is deformed from a childhood injury or if it has a gross racial or familial excess or deformity the same reasons from the patient's point of view can be taken into account for improving the appearance as are regarded following acute injury (Figs 1 and 2)

The nose was the field for the first plastic surgery accounts of which go back many centuries Of interest also is that the first recorded use of pressure dressings in surgery was reported as applied to the nose This occurs in the hieroglyphics as recorded in the Edwin Smyth Surgical Papyrus

The exact origin of plastic surgery of the nose is obscure but India supplied many subjects for replacement because of a form of punishment of cutting off the nose The method in India was a direct forehead flap with no special reference to providing a lining One report of the method stated however that the operation is always successful and that the nose looks nearly as well as the natural one

Brief reference to this work may be of some interest and it is outlined from the original legend in Figure 3 taken from Joseph as follows From the *Madras Gazette* in 1793— Cowasjee A Mahratta of the Cast of the Husbandmen He was bullock driver with the English Army in the War of 1792 and was made a prisoner by Tippoo who cut off his nose and one of his hands In this state he joined the Bombay Army near Seringapatam and is now a pensioner of the H E.T Company For about twelve months he remained without a nose when he had a new one put on by a Mahratta surgeon at Kumar near Poona This operation is not uncommon in India and has been practiced for time immemorial Two of the medical gentlemen Mr Thos Cruso and Mr James Findlay of the Bombay Presidency have seen it performed as follows. A thin plate of wax is fitted to the stump of the nose so as to make a nose of a good appearance it is then flattened and laid on the forehead A line is drawn around the wax which is then of

Figure 1 Reduction in size of nose with improvement that shows essential qualities of the work for the patient's benefit Expression of the entire face is improved by a single operation on the nose, including reconstruction of the lower lateral cartilages by eversion without rim incisions

no further use and the operator then dissects off as much skin as it covered leaving undivided a small slip between the eyes This slip preserves the circulation till a union has taken place between the new and old parts The Cicatrice of the stump of the nose is next pared off and immediately behind this raw part an incision is made through the skin which passes around both alae and goes along the upper lip The skin is now brought down from the forehead and being twisted half around its edge is inserted into this incision so that a nose is formed with a double hold above and with its alae and septum below fixed in the incision. A little Terra Japonica is softened with water and being spread on slips of cloth five or six of these are placed over each other to secure the joining No other dressing but this cement is used for four days It is then removed and cloths dipped in Ghee (a kind of butter) are applied The connecting slip of skin is divided about the twenty fifty day when a little more dissection is necessary to improve the appearance of the new nose For five or six days after the operation the patient is made to lie on his back and on the tenth day bits of soft cloth are put into the nostrils to keep them sufficiently open. This opera

Figure 2 Clearing up of whole expression appearance of lengthening lip reduction of hanging columella all done in one operation including reconstruction of lower lateral cartilages by eversion technique without rim incisions.

tion is always successful The artificial nose is secure and looks nearly as well as the natural one, nor is the scar on the forehead very observable after a length of time"

Figure 3 Indian forehead flap for nose reconstruction Description in text (From Joseph)

The picture from which this engraving is made was painted in January, 1794, ten months after the operation

The Italian method described by Gasparo Tagliacozzi, "De Chirurgia curtorum per insitionem," Venice, 1597, consists of a delayed retrograde flap from the arm which apparently tubed itself This work of Tagliacozzi is usually taken to be the premier treatise on plastic surgery, the accompany-

ing illustrations are well known and the reproductions here are borrowed from Joseph (Fig 4)

These two methods the Indian (forehead) and the Italian (arm flap) remain today as useful procedures with the refinements the centuries would bring not the least of which must be anesthesia. Procedures such as homotransplants of noses and even more bizarre methods have been reported such as a homotransplant lasting until the donor died and then shriveling

Figure 4 Italian arm flap method of Tagliacozzi, 1597 The flap is a delayed one on the arm that apparently tubed itself during the delay (From Joseph)

Figure 5 Excellent example of rhinoplasty by Joseph

Figure 6 Bone and cartilage cut down by Joseph

up and dropping off—with omission of how the donor felt about it. The use of a finger transplant has been advocated but has been relegated to oblivion

What is thought of a corrective rhinoplasty or an osteoplastic procedure was mainly developed and described by Jacques Joseph of Berlin after World War I and his procedures are basic ones for the reduction in the size of the nose.

Figure 7 Jacques Joseph pioneer of corrective rhinoplastic surgery

His book (Jacques Joseph *Nasenplastik und sonstige Gesichtsplastik nebst Mammaplastik,* Leipzig 1931 Curt Kabitzsch First edition 1928) is quoted and borrowed from here in respect to his pioneer work, and it is hoped that interest may be found in these acknowledgments as his book is not widely available

Joseph designed many instruments that permitted the intranasal operation his elevator alone is one of the most useful instruments in plastic surgery and his saws are basic patterns.

Although he seemed to pay most attention to the bones the patients in Figures 5 and 6 indicate that he obtained good cartilage alignment with the somewhat limited work he described on the lower cartilages

It is with indebtedness and deep respect that Dr Joseph's picture is presented in Figure 7

Since the time of Joseph there have been many scholars and students who have added greatly to the procedures of corrective plastic surgery of the nose. We wished to include references to the reports of all who have contributed since Joseph, but space was not available for the long list.

The truth, as Socrates said, belongs to everyone, so that the trained plastic surgeon rightfully uses the basic procedures and makes an original contribution in each patient that he is asked to care for, and thus contributes to solving the main problem, which is restoration of normal contour to allow for a possible adjustment of outlook by the patient.

Figure 8. Reduction in size of nose, with reconstruction of lower lateral cartilages so that the square tip as seen from below has been made the desirable triangular shape. The width of the columella has been narrowed. Eversion of cartilages without rim incisions.

The patients in Figures 8 and 9 show recent general reductions in size, using the basic technique of Joseph for reducing the bony height and width. The lower lateral cartilages also have been reconstructed to produce a triangle from below, which is necessary for a satisfactory result. The work

on the cartilages has been done by eversion of them without rim incisions around the nostril borders. This procedure is described in detail under the technique of operation

Figure [illegible] Cutdown of nose with elevation of tip and extensive reconstruction of lower lateral cartilages by eversion without rim incision The width of the lower part of the columella has been reduced and a criterion of a desirable result is indicated by the change from the square to the triangular tip

Chapter II

PREOPERATIVE EXAMINATION AND EVALUATION OF PATIENT FOR PLASTIC SURGERY OF THE NOSE

In evaluating a patient as to whether nasal surgery should be undertaken and what might be accomplished, his abnormalities in contour anatomy and surgical anatomy are considered in relation to the general indications for operation, and especially in relations to his own indications

INDICATIONS FOR CORRECTIVE RHINOPLASTY

One function of the face is appearance, and the nose is the most prominent feature of the face This function of appearance of the nose may be interfered with by distortions arising from trauma, racial, familial, or atavistic deformity, new growths, and other causes, and may be restored in many instances by corrective rhinoplastic surgery This might be considered a surgical answer to a psychological problem, with an excellent percentage of recovery The brief hospitalization required does not seem out of line in view of the vast hospitalization and expense involved in psychological problems without such an anatomical basis

The old idea that the function of the nose was solely that of an air vent and sinus drain developed in the last century when little other nasal surgery was known The surgeons trained under this regime seldom operated upon the nose at all, to them, the nose was often just an obstacle to good access for surgery on the sinuses Many patients, today, however, with crooked or deformed noses feel that they deserve something more than just to have an air shaft sunk through the nose, and plastic surgical reconstruction can provide the best answer to their problems

On the other hand, just because a deflected septum is to be removed is no reason that the contour of a nose should be altered, or an attempt made to improve appearance which has not disturbed the patient A physiological operation need not be an excuse for correction of contour

The patient's desire for correction of a deformity is the main reason for undertaking a rhinoplastic procedure This desire should be one that has arisen spontaneously within him, it is unwise to suggest correction of deformities that have not previously bothered the patient Considerable variation will be found in patients' reactions to their deformities and what might be completely accepted by one person may be very distressing to another The wish of the individual patient is the primary consideration, but this

may be tempered by the conservative ideas of the experienced su
for the best outcome.

The physiology of the nasal airway is of such importance that cl
operation between the rhinologist and plastic surgeon is advisable C
service questions of intranasal physiology are met by rhinologists and
ably corrected before plastic surgery is undertaken At times minor
resections and corrective rhinoplasty can be carried out at the same
tion but where airway clearance is a major factor it may be best to
the work into separate procedures.

Psychological considerations are of great importance in evaluati
tients for operation. It may be difficult or impossible to convince a p
that a deformed nose that he has disliked and tried to hide for years
be relieved by an apporach that does not correct the deformity C
other hand the most careful selection of patients for operation is
sary and borderline cases need especially careful evaluation Better
may be secured in some of these by psychiatric means than by operati
imaginary or slight deviations from normal Psychiatric help may a
needed when a patient continues to be disturbed by his nose after an
tion which has accomplished all that can be done by surgical means
would be better to anticipate this and avoid surgery in such patients
ever possible

If a defect cannot be seen by the surgeon then no attempt sho
made to operate The degree of deformity requiring operation is di
for patients of different personalities and sensitivity but some perso
be seen who express great concern over their appearance and then are u
to define the defect or even to find it themselves. It is well to beware
patient with all sorts of measurements and ideas and photographs of
and of ones who speak of certain shadows and highlights as seen fro
tain angles. People who are definitely neurotic or who have some perso
defect with attention centered on the nose should not be operated up
they will be difficult to please and if pleased about the nose will pro
concentrate on something else

Corrective rhinoplasty can do a great deal for the essentially norm
son who is reasonably well adjusted to his environment but just do
like an obvious deformity of his or her nose Corrective rhinoplasty w
little for the individual who is chronically unhappy or emotionally
about many things it will not cure a neurosis or psychosis These latt
tients should obviously be treated by a neuropsychiatrist but even an
recommendation from him for operation should be carefully weigh
the plastic surgeon

One reason for the foregoing statements is that nasal deformity
does not seem capable of producing a psychosis, unless there are str

and more important underlying tendencies which might be activated by many things. As confirmation of this, one can refer to the thousands of wounded soldiers in World War II cared for by the plastic services, in which there was probably not one instance of even severe facial deformities giving rise to a psychosis, without a previously demonstrated strong basic potential. There has been much overemphasis on the restoration of facial contour for the relief of character and personality defects, and it has been extended even to the attempted reclamation of criminals. Anyone who has seen the courage and splendid adjustments of the thousands of maimed soldiers just mentioned will find it almost impossible to believe that facial or nasal deformity in itself creates criminals. Inmates of penal institutions could have plastic surgery considered the same as any other group, but widespread policies of changing criminals' features routinely would probably not be advantageous to any one.

In all borderline and many other cases, psychiatric help is obtained and appreciated. These suggestions are not intended as authoritative coverage of all of the psychological and psychiatric aspects of this work, but as a brief guide to what past experience has shown may be accomplished by the plastic surgeon in his lifework of caring for deformed persons.

Reasons for operation may include other considerations besides gross distortions which obviously require correction for normal appearance and function. Some of these follow:

Interference with normal expression, as in smiling, may occur with the tip of the nose pulled down in front of the lip.

Lip distortion may occur in smiling and shorten to an abnormal appearance if there is a large protruding nasal spine. Taking out the spine or soft tissue web may correct this angle and make the lip look longer.

Columellar webbing without a normal angle may be quite noticeable and objectionable.

Wide bony noses and flared nostrils may give the appearance of the face hanging on the nose rather than the nose resting on the face.

Distorted noses, especially hooked or long ones, tend to become worse as the patient grows older, in both men and women. Numerous in
are seen of patients in their forties who finally seek operatio
who have suffered with their appearance for many years only
coming worse. Since these patients did seek relief eventually,
been better for them to have had their operations early and
free of their anxiety through those years.

Women and girls do not like aquiline or hooked noses
this deformity is indication for operation. In studying pla
original side will appear masculine and the side cut down to
tour will appear feminine. The operation aims at a change
ity or masculinity to femininity. Men not likely to

much aquilinity if it has developed from a fracture, or if it hinders them in their work or profession

It is important to remember that some patients may have only a hazy idea of what is the trouble and this should be clearly decided before operation or else unpleasant reactions on their part to a new normal contour may develop

Professional actors models, and others whose livelihood requires appearance before the public may require operations that those in other occupations might not need Dramatic economic and career advantages have developed following nasal corrections.

Corrective rhinoplastic surgery is not to be undertaken because of the assumed or expressed wishes of any third person including husbands and wives.

Corrective rhinoplastic surgery is not undertaken for minor deformities in people who have obvious major deficiencies in their personal habits and appearance Patients have been seen who would benefit more from dental hygiene and restorations, facial cleanliness, and hair grooming than they would from operation alone without attention to these other details.

A sensitive refined person may benefit from minor corrections which would mean little to the other group unless the other elements were corrected. Occasional difficulties will be encountered by any surgeon or other physician for that matter in selecting these patients, and this points to importance of care and the necessity of experience. The opinion of the patient and of his medical advisors may be very helpful in deciding whether a rhinoplasty would help him but for the best outcome the final decision must be made by the surgeon who is going to do the work

CONTOUR ANATOMY OF THE NOSE

Contour anatomy is a term suggested to designate a definite function of the nose which is that of being normal in appearance Although the nose encloses the airways and is used to breathe through it is also the most prominent feature of the face and deviations from normal may have to be restored to normal contour anatomy for the best function of the patient as a whole This is most important in sensitive patients their peace of mind may be restored by a surgical procedure even though they have suffered for years and have not fully used their power of expression especially in smiling because a deformed nose is likely to look worse when the patient smiles

Ideal angles and proportions of noses have a fairly wide variation and are dependent on other features of the face such as prominence of the chin recession of the forehead tilt of the upper lip and length of the middle third of the face

The angle of the nose from the face (nasofacial angle) is often ideal at about 36° may go up to 40° and still be pleasing but should never be less than 30 The angle is measured between the perpendicular plane of the

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Women and girls do not like aquiline or hooked noses—none do—and this deformity is indication for operation In studying plaster casts, the original side will appear masculine and the side cut down to normal contour will appear feminine The operation aims at a change from aquilinity or masculinity to femininity Men are also not likely to care for too

much aquilinity if it has developed from a fracture, or if it hinders them in their work or profession.

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face (a line touching the prominences of the forehead and chin) and the dorsal plane of the nose The effect of variations in the angle on the appearance of a patient is shown in the drawings in Figure 10

Variations of this angle are seen if the tip of the nose protrudes or is elongated in a Cyrano deformity In these patients, if the angle is measured through the tip, it is seen in Figure 11 not to be so great as if it were measured flat out off a hump

One difficulty with this angle is that although it is most important in profile and causes criticism of the feature, still it is not the angle seen most often by the patient, and the whole design of the new contour anatomy does not depend on this angle alone, especially if the *patient is quite concerned* about the front elevation If this angle is made too flat on the face, the flatness can be noticed from the front, and some patients will have difficulty in becoming accustomed to the new angle, especially if the lower fleshy part of the nose is thick and wide It is suggested, therefore, not to make dorsal lines so low as to appear flattened to the patient

The columellar-lip angle for men and women is sometimes best at 90° (Fig 12) but can be increased up to as much as 120° in some piquant faces, with pleasing contour resulting For the patient who did not smile because of the tip pulling over the nose, the angle may be opened to 100° or more Along with this, if the lip is short, raising the whole columellar line toward the vertex by taking away the protruding nasal spine may improve the lip by making it appear longer

This elevation of the whole columellar line shortens the entire nose and is not the same as tilting the tip up Simply opening the angle will not make the lip appear longer if there is a protruding nasal spine or rounded septal border

For smiling purposes, this angle is often opened to 100°, but care is taken *not to leave too much open nostril exposed* from the front, since this is another change that is difficult for patients to get used to, especially the older ones Though they may not have smiled for a long time because of the pulldown of the tip of the nose, they may dislike equally looking into open nostrils The only certain prevention is not to open this angle so far, but careful reconstruction of the lower laterals, avoiding rim incisions, narrowing the columella if necessary, and producing a pleasing triangle from below will produce so much worth-while improvement that most normal patients will adjust to the new elevation of the nostrils without too much difficulty

The appearance of three planes on the profile view of the nose is ideal for most patients This means a dorsal plane, a columellar plane, and a slanting plane between them, the tip plane There is a definite break or angle between the columellar plane and tip plane This is difficult to pro-

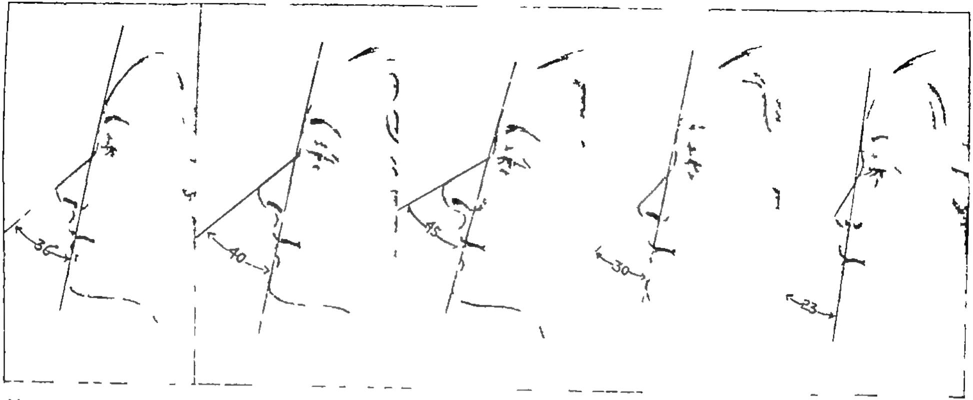


Figure 10 Drawings showing effects of various nasofacial angles on appearance of face shown in Figure 9 This angle largely controls the size of the nose 36 is about ideal with the desirable limits between 30 and 40 on various faces.

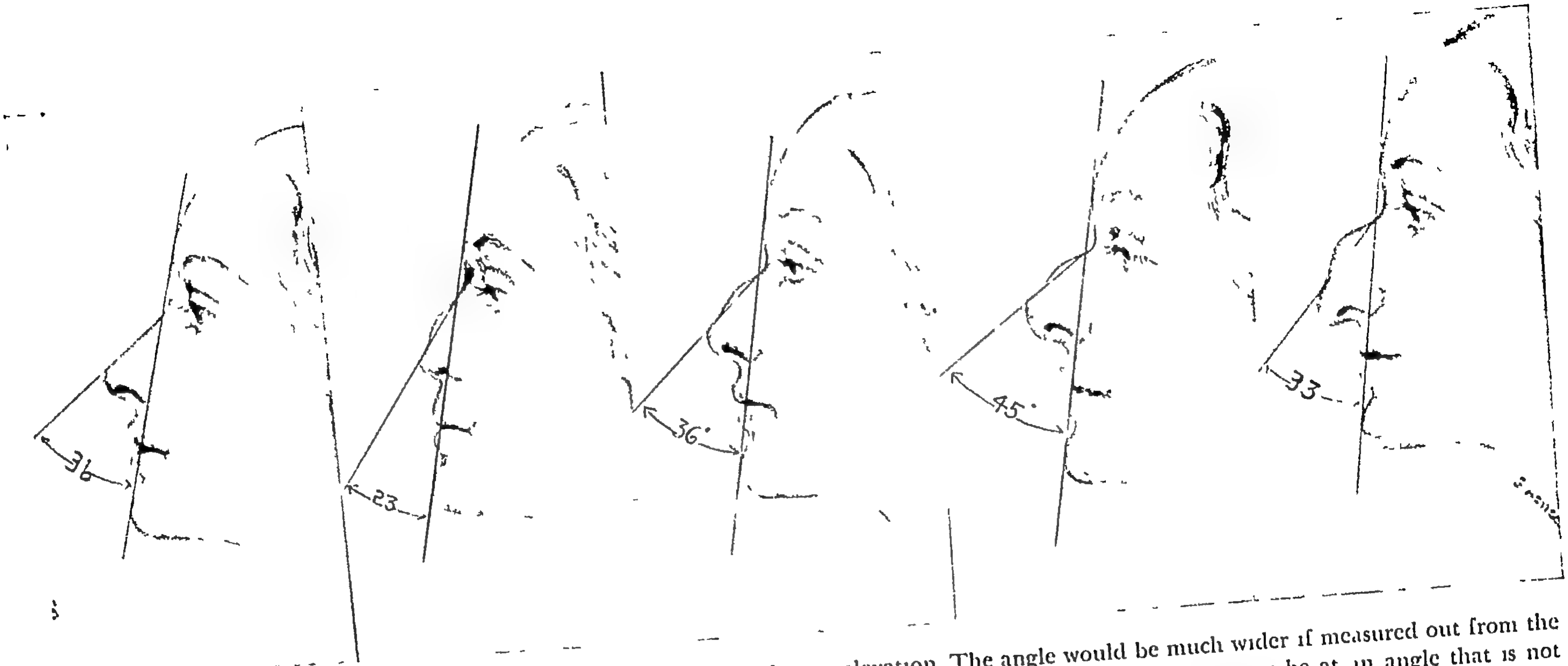


Figure 11 The nasofacial angle is measured through any hump to the tip elevation The angle would be much wider if measured out from the surface of the hump, but even with a large hump, when the angle is measured properly, the true dorsal line may be at an angle that is not excessive Some humped noses will require removal of the hump and resection of even more nose to bring it down to the desired angle, others will require hump resection plus elevation of the tip to bring it out to the desired angle

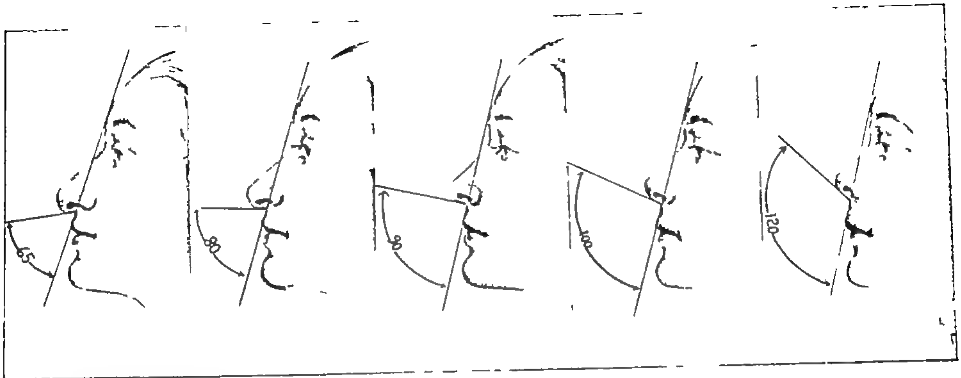


Figure 12. Columellar lip angles with 90 to 110 seeming ideal, but certain piquant faces with straighter lips can tolerate an angle of 120. The three profile planes of the nose are seen in 90 and 100 drawings. The need for elevating the whole columella toward the vertex in addition to opening the angle is seen in the 65 nose.

duce if there is not already some tendency to it, but is pleasing when possible The planes are shown in the 90° and 100° noses drawn in Figure 12

SURGICAL ANATOMY OF THE NOSE

The external nose is a pyramid, extending to the glabella above and terminating in the nasal tip below The variations in the shape of the entire nose, and in its component parts, seem almost infinite

For surgical purposes, the framework may be divided into upper, middle, and lower thirds The upper third is bony, consisting of the two nasal bones and the nasal processes of the two maxillae, the latter form the greater bulk of the bony framework and their junction with the facial surfaces of the maxillae is curved and indefinite (Figs 13 and 14)

The two upper lateral cartilages form the framework of the middle third Each is roughly triangular in shape and they extend from the bony nose above to the alar cartilages below The junction with the bones above is usually fairly firm, but may not be end-to-end The connection with the alar cartilages below is usually a loose fibrous one, and may be a sleeve joint, with the lower ends of the upper laterals projecting a little down underneath the upper borders of the alar cartilages There is some variation in the relation of the upper laterals to the septum, but in many instances they seem to be formed by a splitting and turning apart of the anterior portion of the septal cartilage (see Fig 13, insert)

The two alar cartilages (also called lower lateral cartilages, or saddle cartilages) form the framework of the lower third of the nose Each consists of a lateral (horizontal) crus within the ala or nostril wall, and a medial (vertical) crus within the columella The junction of the lateral and medial crus is known as the "dome" of the alar cartilage The variations in sizes and shapes of alar cartilages are great and are responsible for most tip deformities Two to four tiny chips of cartilage known as the accessory cartilages are commonly present within the nostril bases, but are only occasionally of surgical importance

The nasal septum is the supporting armature of the nose, particularly from the nasal bones to down between the domes of the alar cartilages where the lower points of the upper laterals terminate Loss of septal support usually means depression or collapse of that segment of the nose It is true that an occasional syphilitic nose is seen in which the septum is gone and the tip remains forward, but this is due to the extensive fibrosis as shown by the fact that the alar cartilages in such cases are also often badly damaged or even destroyed In most noses, the dorsal line of the septum will be the dorsal plane of the nose, and the lower line of the septum will be the columellar plane (except in inherent deformities within the columella)

Between the two nostrils is the columella Its framework in the anterior two thirds is the two medial cruces of the alar cartilages (separated by vary-

ing amounts of soft tissue) and in the posterior third (or less) the nasal spine of the maxilla The columella is covered on both sides and inferiorly by skin which continues upward to the level of the cartilaginous septum where it gradually blends into the septal mucosa This skin attachment between the medial cruces and the septal cartilage is known as the membranous septum.

Skin likewise lines the alar cartilages up as far as the upper laterals but these latter cartilages and the bony nose are lined with mucosa

The septal cartilage does not normally come down within the columella and the surgical implantation of it in this position is not only anatomically wrong but may result in an unsightly thick columella

The amount of subcutaneous tissue in noses varies from almost none to a great deal and this latter may be an important factor in many deformities. There are five described small muscles on either side of the external nose four of which are located mostly within the nostril and are concerned with nostril dilatation and compression Hypertrophy of these may contribute to thickened nostril walls and bases and in addition may change the shape of the cartilages by their overactivity The fifth muscle is a vestigial one known as the procerus it covers the nasal bones and crosses the glabellar angle to unite with the frontalis above. Hypertrophy of this muscle is a common cause of the Grecian deformity in which there is little or no glabellar angle.

Accumulations of subcutaneous fat and connective tissue are common and are responsible for many thick wide noses When this is the case the remedy lies in removal of this fat and connective tissue rather than in trimming the framework

A more detailed and complete description of the anatomy of the nose can be obtained from the standard reference works on anatomy but they will not emphasize the multiplicity of variations that will be found nor some of the factors of surgical importance noted in this brief summary

AGE FOR OPERATION

Complete rhinoplasties are usually not done before the nose has grown to full size but if distortion is increasing or the patient s reaction is severe operation is done in the middle or late teens. Twisted fractures however can be straightened in younger children Operations in later years should be more conservative in the degree of change carried out as older patients may not adjust to a different contour as easily as young people

DESIGNING THE OPERATION FOR EACH PATIENT

Various procedures which may be included in a complete rhinoplasty are described in Chapters IV through IX and in some later chapters There is however no such thing as a routine rhinoplasty and the various opera

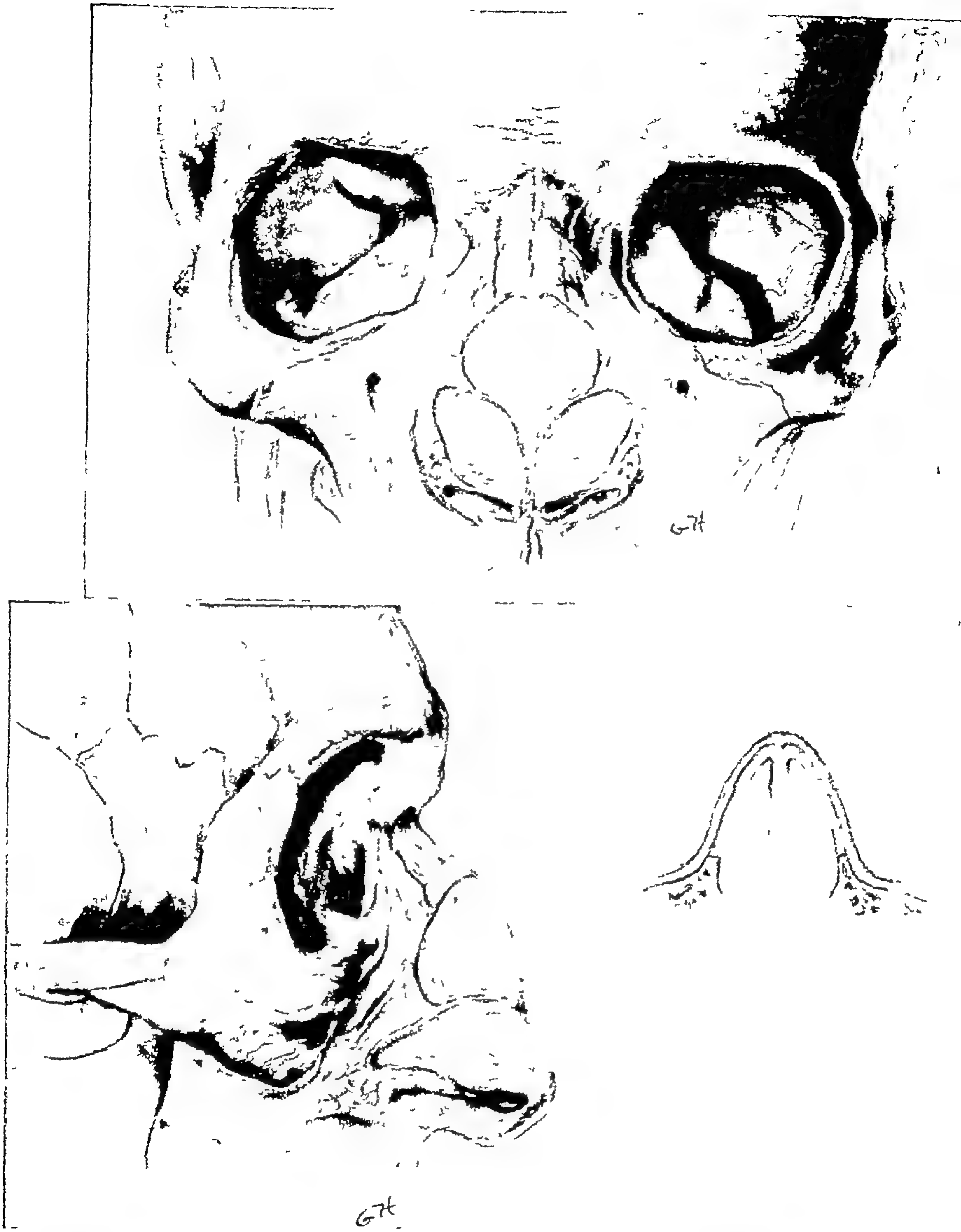


Figure 13 The major skeletal anatomy of the nose in front and profile views The larger segment of the bony nose consists of the frontal processes of the maxillae, with the nasal bones resting on them anteriorly The paired cartilages in the midsection are the upper laterals The paired cartilages in the lower nose are the alars Insert is a cross section through the midnose, showing the derivation of the upper laterals from the septum

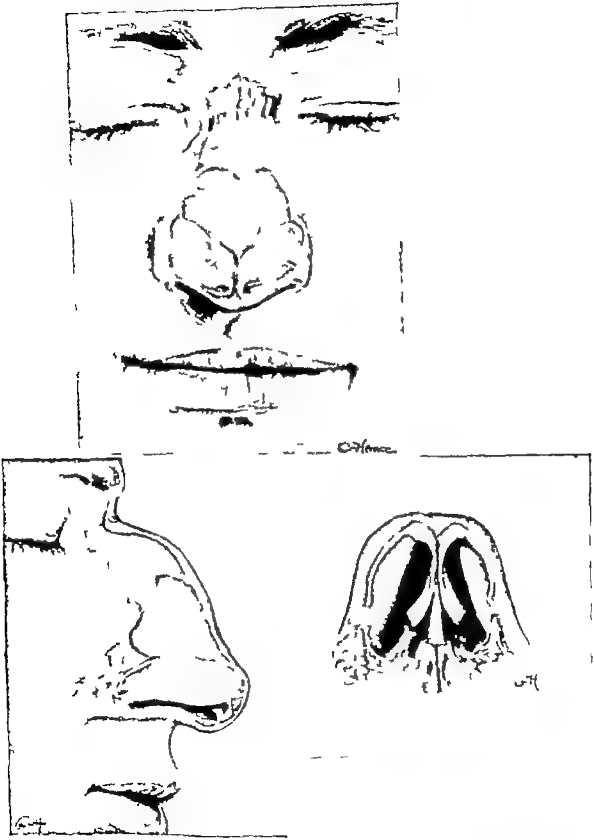


Figure 14 The skeleton of the nose with soft tissues superimposed. The bottom view of the alar cartilages is important. Also note the insertion of the lower end of the septum into the bony nasal spine of the maxilla in this view.

tive maneuvers required for each patient are selected and put together to **design an operation** for the relief of his individual deformities, and in accordance with his wishes

Diagnosis of what is missing, or displaced, or distorted, is of first importance when the patient has been accepted for operation This has do do with deviation from the normal contour and surgical anatomy, and with the physiology of the airways This latter phase may require the assistance of a rhinologist and arrangements for the work on the airways to be done at the same time as the plastic work, or before it Without diagnosis, the correction cannot be started

Diagnosis and design are closely related The armature or support of the nose is the basis of the general design, but this may be modified by thick skin which will not shrink and conform to a smaller framework For this reason, persons with thick, oily skins may have difficulty in obtaining a satisfactory result This is so important that some surgeons will not attempt operations in these patients

There may be marked enlargement of the cartilaginous nose with its attached skin, or there may be a large hump and a very short columella In these disproportions of framework and skin, simply doing routine procedures may leave unsatisfactory results

Operating on the cause of the distortion is important If the skin or cartilages are at fault, then bony operation will not suffice, and vice versa There are certain inherent defects of parts such as hanging or short columella, or nostrils that are too large or too small, and operations on the bony support will not influence them greatly These problems must be met in their own location, and resection of skin may be necessary If the nostrils are short, it may not do much good to try to advance them on the septum, because they are still the same size and will finally pull the tip back down into a rounded hook In this instance, it may be better initially to cut the septum clear down to the nostril height

Gross reductions are undertaken carefully because a patient who is used to seeing a large nose from the front may have difficulty in adjusting to a smaller nose, even though this may be correct for him

Skin excisions are more often indicated than is apparent in the literature, and usually can be done at the nostril base with little apparent scar There is no reason to leave a heavy, blobby, bulbous nose when it can be relieved by resection of alar skin

The porcine nostril deformity associated with double cleft lips can be relieved better by this alar base skin excision than by any other method, and there are great numbers of unfortunate persons who should have this procedure carried out

Footage Measurement of Deformities. This term has been coined to help in planning and to help the patient in his own decisions The deformity that

can be seen from the greatest distance is the worst and needs the most correction For instance in some secondary cleft lips the nasal hook may be seen farther away than the lip scar and the nasal correction in these will prove to be of the greater benefit to the patient. The term is also used in gross deformities sometimes to divide the work into stages for example if a defect is originally visible at fifty feet, one operation may not eliminate it but may improve it until it is visible no farthur than twenty feet. Subsequent operations may improve it until it is visible no farther than ten or even three feet. This affords an estimate of progress and also points out to the patient that some gross deformities may never be made perfect if the material is not there to use or if there is so much material present that it cannot conform to the ideal framework.

METHODS OF STUDY CASTS PHOTOGRAPHS MEASUREMENTS

The proposed new profile can be inked out on the nose as the simplest method Photographs are important for records and may be cut down as desired in silhouette The desired front elevation may be determined from study and consideration of the new profile angles.

Casts of the nose and face are most ideal for study and also for the patient s interest and his peace of mind. They can be made of plaster of Paris or wax and are cut down or built up as desired on one side retaining the old profile and on the other showing the desired new profile for use in the operating room Wax casts are made in the usual prescribed manner and have the advantages of lightness and of being available for use again if desired Wax and plaster may be alternated for positive and negative

Plaster of Paris casts are made with ordinary dental plaster The face is greased lightly with particular attention to the brows and lashes and a thin plaster negative built up as shown in Figure 15 It is not necessary to use breathing tubes or keep the mouth open if there is an adequate nasal airway and care is taken to leave a small opening in each nostril A good clear impression of the whole face is taken—not just the nose (Figs 15 and 16)

The negative is gently loosened when firm and is allowed to dry over night or is baked in an oven to harden quickly

The positive is poured with the same kind of plaster after the inside of the negative has been soaped greased or powdered to facilitate separation After hardening the negative may be cracked off as shown in Figure 16 or it may be carefully pried loose in one piece if additional positives are to be made

Cutting down the new profile line for study and for benefit to the patient is shown in Figures 17 and 18 along with dorsal segments removed.

A profilometer and a rhinoscoliometer were described by Joseph for determining angulation and degrees of correction These are illustrated in

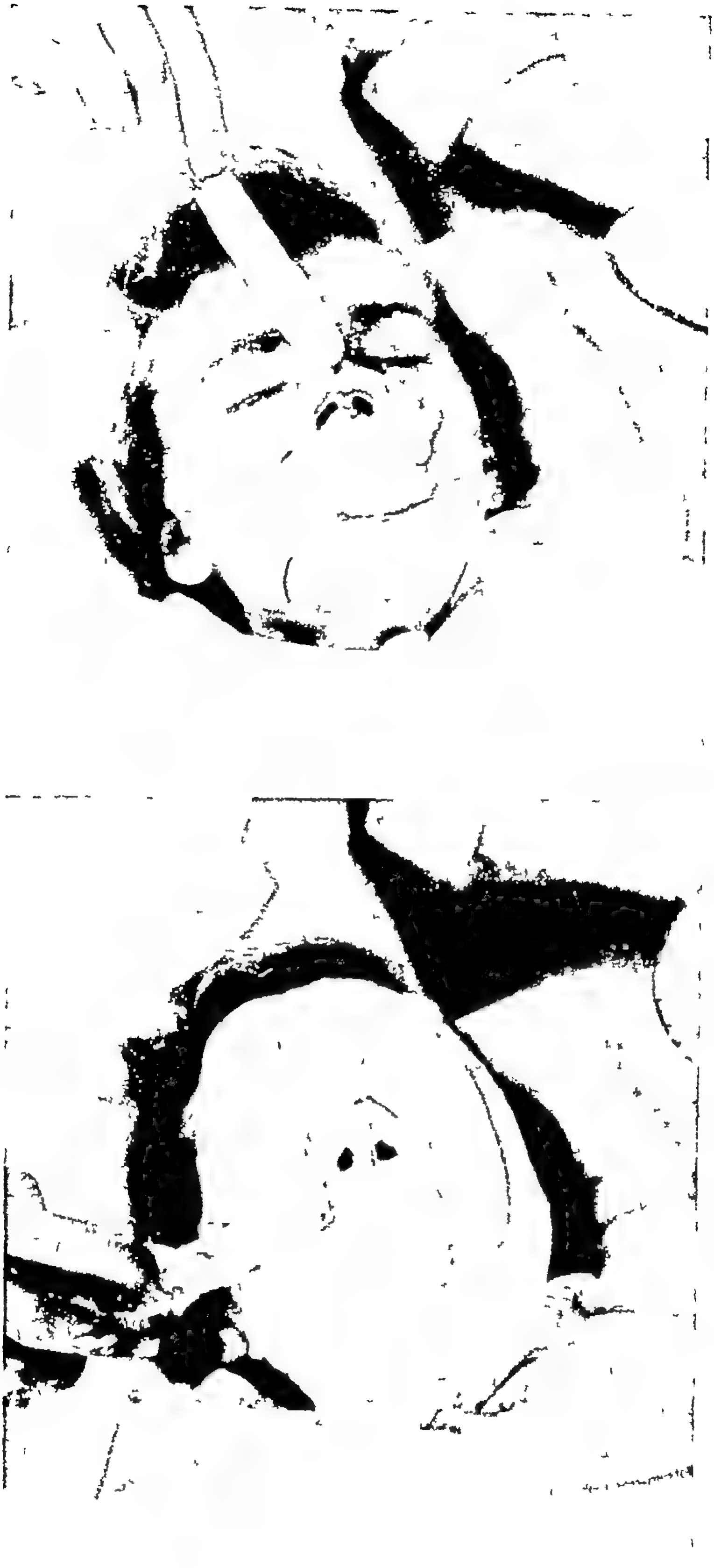


Figure 15 Preparation of plaster of Paris negative mask of the whole face for study of the nose in relation to other features. The plaster used is quick-setting dental plaster, and it is prepared to the consistency of thick cream or thin paste before application. Breathing tubes are not necessary if the plaster mix is firm and is built up carefully around the nostrils (if nasal airways are adequate).

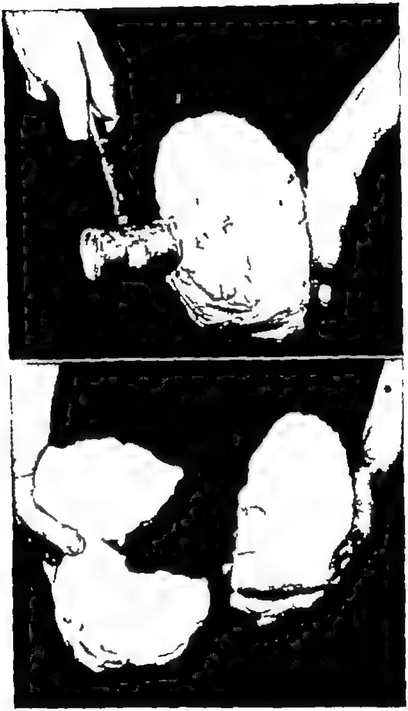


Figure 16. Quick removal of the thin negative from its plaster positive by breaking the negative with a wooden mallet. If more than one positive is desired the negative is made thicker and eased off in one piece

Figure 17 Method of cutting down one side of the nose on the cast for study and comparison of the present and contemplated profiles The cut surface of the plaster is blackened with India ink so that the new profile may be seen more clearly

Figure 18 Original profile of patient working cast and hump segment removed

Figure 19 and several variations of them have been introduced by other workers in later years

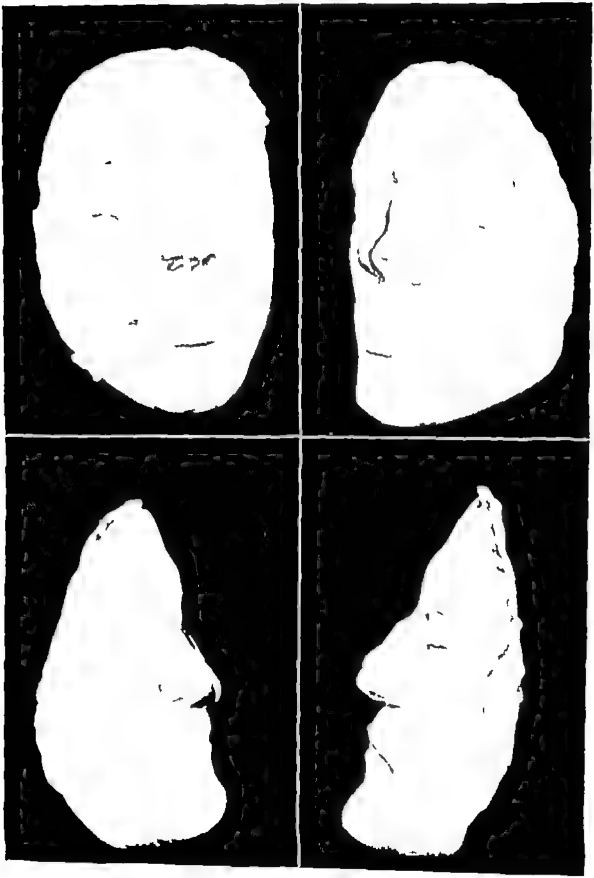
In cutting down the bony and cartilaginous dorsum it is best to not re move as much bone as indicated by the photograph cast, x ray (Fig 20) or other measurement because of the thickness of the saw cut. It should also be remembered that fullness in the glabellar region may be due to soft tissue bridged across rather than bone Patients do not like the appearance of a retruded nose any more than a prominent one and a dorsal line that is too low is more difficult to restore than one that is too high

Building up the dorsal line may be required as described in Chapter XII The casts are quite useful in study of these cases as shown in Figure 21 *A* and *B* show evident need for a dorsal transplant *C* and *D* show a mixed type needing cut down of hump and tip and possible elevation of the lower dorsal line This double necessity may require two operations the first one to reform the bone and soft tissue and the second to elevate the dorsum but the first frequently may suffice

Figure 19 Illustrations of profilometer and rhinoscoliometer taken from Joseph's book (1931)

Figure 20 Flash x-ray silhouette study of huge nose, with exposure light enough to show skin and cartilages in relation to bone The cartilaginous framework is mainly responsible for the great size of this nose

Figure 21 Working casts used for study of depressed noses built up to normal contour anatomy with clay or wax Upper photographs show nose requiring straight build up with cartilage or bone transplant Lower photographs show another nose with mixed deformity requiring resection of hump and shortening but also build up of lower middle dorsum with a transplant



The general effect of elevating the tip and building up the dorsal line with an L-shaped transplant of cartilage or bone is shown in front, profile, and lower views (Figs 22 and 23) The expression is cleared from the front, the tip is supported, and the patient can smile without pulling the tip down Breathing may also be helped if it has been obstructed by the depressed tip

Figure 22 Elevation and stability of dorsum and tip with L-shaped dorsal transplant of cartilage or bone

Small changes in the nose, either cutdowns or elevations, are usually more difficult to make than larger corrections in which almost any change would be an improvement These changes are just as important, however, and may mean even more, relatively, to some patients than would gross changes to others It is well to let the patient realize that the small change may be more difficult technically (Fig 24)

A conservative approach in the planning and execution of the whole problem is urged to give new hope and status to persons burdened with deformed features, but with utilization of all existing knowledge to endeavor to make each effort worth while to some patient (Figs 25, 26, and 27)

Figure 23 Improvement in front elevation a flat deformed nose from injury by insertion of L-shaped cartilage or bone transplant Same patient as Figure 22.

Figure 24 Small cutdown, nevertheless requiring all elements of operative reduction

Figure 25 Cutdown of huge nose with thick skin almost requiring skin excision

Figure 26 Large nose reduced in size in one operation with new contour anatomy of dorsal and columellar line new triangle from below no rim incision

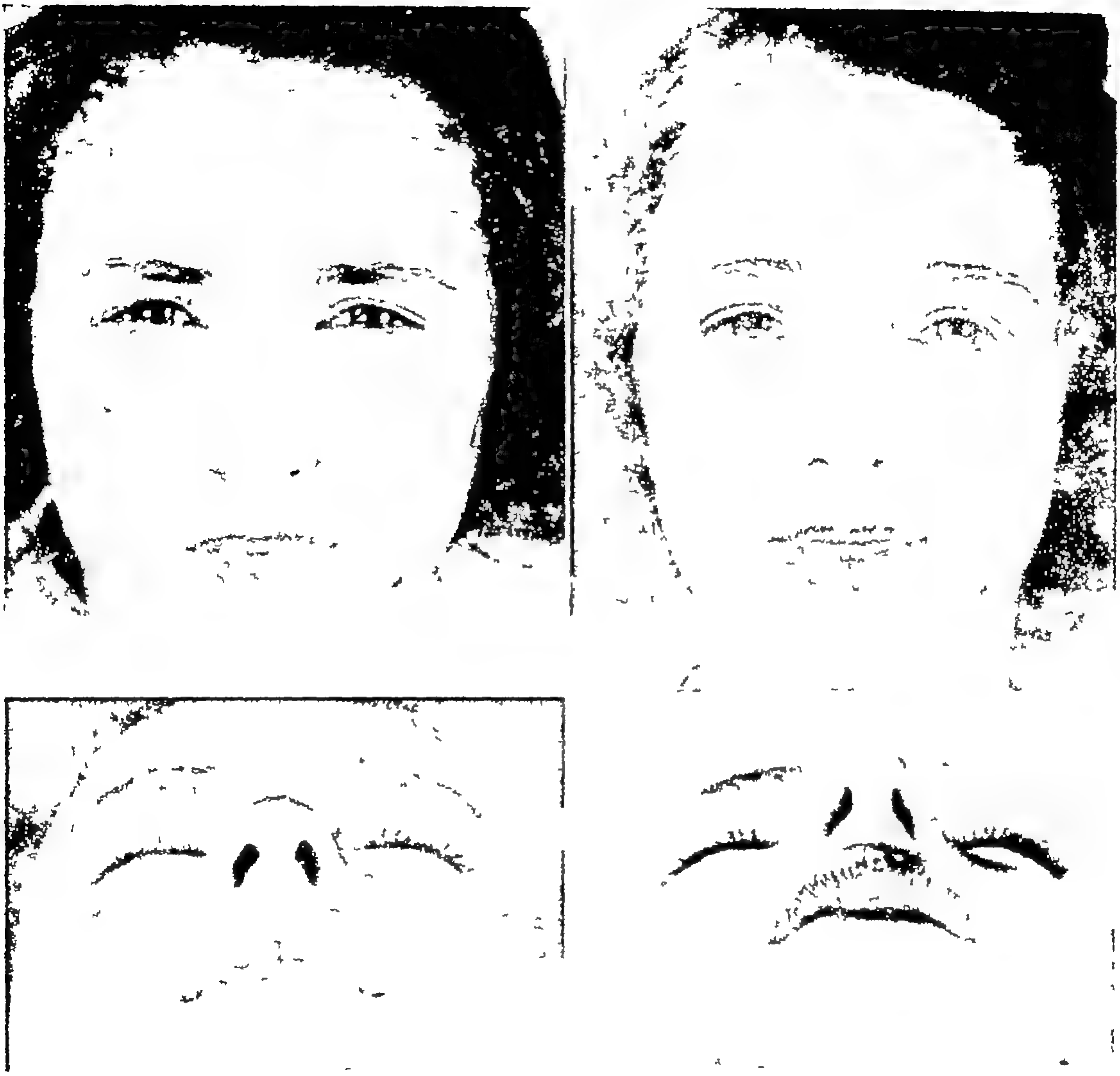


Figure 27 Result of operative reduct ... ncluding narrowing of
columella Lower lateral cartilages ... thout rim incision

Plastic surgery of the nose has so far advanced that it is usually possible to effect worth while surgical improvements in most nasal deformities Perfection may not be attained however and it is not always possible to bring about in each patient the improvement that he desires or deserves and it is best to explain this before operation

Before undertaking this work the surgeon s repertoire should include all of the best plastic surgical operative procedures In addition he must acquire adeptness in each minute precision in his operative technique and an understanding of the viewpoints of patients with deformities The development of these requires study patience persistence and especially time but the challenge presented by these cases is worth trying to meet

These operations are major procedures from the patient s point of view and should be done with all the worth and dignity ascribed to any major operation Levity about these deformities has been rampant with the classic example of Cyrano but the surgical approach and responsibility can be put on the level of any other procedure in the surgery of rehabilitation

Chapter III

PRELIMINARY PREPARATIONS, ANESTHESIA, AND INSTRUMENTS

ROUTINE PRELIMINARIES are essential, but these patients can be relieved of nonessentials such as enemas, diet restrictions, and other useless regimentation

Since many of these patients are being operated upon to relieve unhappiness, the attitude of the hospital personnel should not be one of grave concern or flippancy, but there apparently is no known way to control this

Acute respiratory infections and pustules in the operative field are contraindications to operation Atrophic rhinitis usually need not prevent operation, and reducing the size of the air chambers in a large nose may give some relief to this condition

A mild sedative is given the night before operation Preoperative medication may be morphine gr 1/6 for the average adult, combined with a barbiturate, such as gr iss to gr iii of sodium pentobarbital given one hour before operation The vibrissae are clipped and the interior of the nose cleaned with a mild antiseptic on applicators

INSTRUMENTS

Instruments are laid out on a small table (Fig 28), those used by the operator at the front and by the assistant at the back The special nasal instruments are on a second small table (Fig 29) Simplicity in instruments makes for directness in operating It is better to have a smaller number of quality tools made in the correct pattern* than to have a profusion of instruments of questionable utility

The care of these instruments is important All sharp tools are sterilized by soaking in a suitable solution, rather than autoclaving, and the cutting edges are not jostled against other instruments They are soaked only for the necessary length of time, and then carefully dried with a sterile towel After operation, they are washed and then sterilized and dried again before being put away Instruments made for cutting soft tissues are not used on bone, dissecting scissors are not used to cut gauze, sutures, or other foreign materials One forceful cut on a tough object can ruin both the set and edge on these delicate scissors

*The Storz Instrument Co, 4570 Audubon, St Louis, Mo, makes nasal instruments in patterns approved by the authors

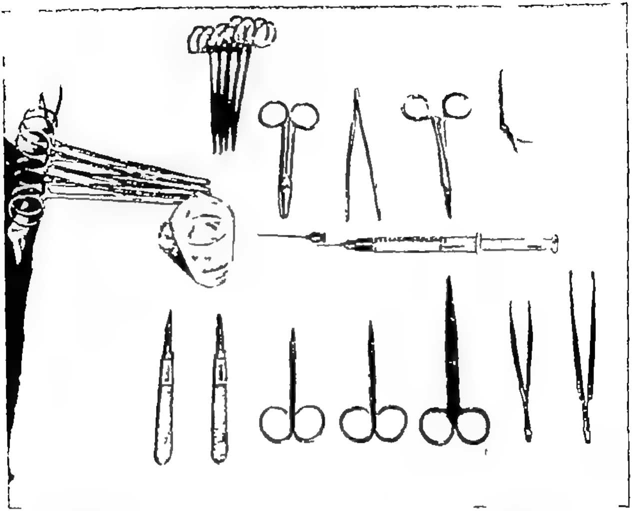


Figure 28 Standard dissecting set on small table. *Front row* instruments for surgeon and *back row* those for assistant. The small scissors are variations of curved iris scissors one has short blades with blunt tips, and the other has longer blades with sharp tips

A special operating table is advantageous This has a solidly constructed headrest swiveled on a double universal joint so that it can be placed into any desirable position The table is narrower than those used for abdominal surgery so that the operator can get closer to the head and neck and have better access and more freedom of movement in those areas Padded narrow armrests are comfortable for the patient and keep the arms and hands out of the operator s way (Fig 30)

The patient s face and neck are painted with a strawcolored tincture of iodine less than 1 per cent in strength Two sterile towels are slipped simultaneously under the patient s head the lower one covers the headrest and the upper one is wrapped tightly around the hairline and clipped securely A large sterile sheet completes the draping (Fig 30)

The inside of the nose is cleansed with applicators dipped in the weak

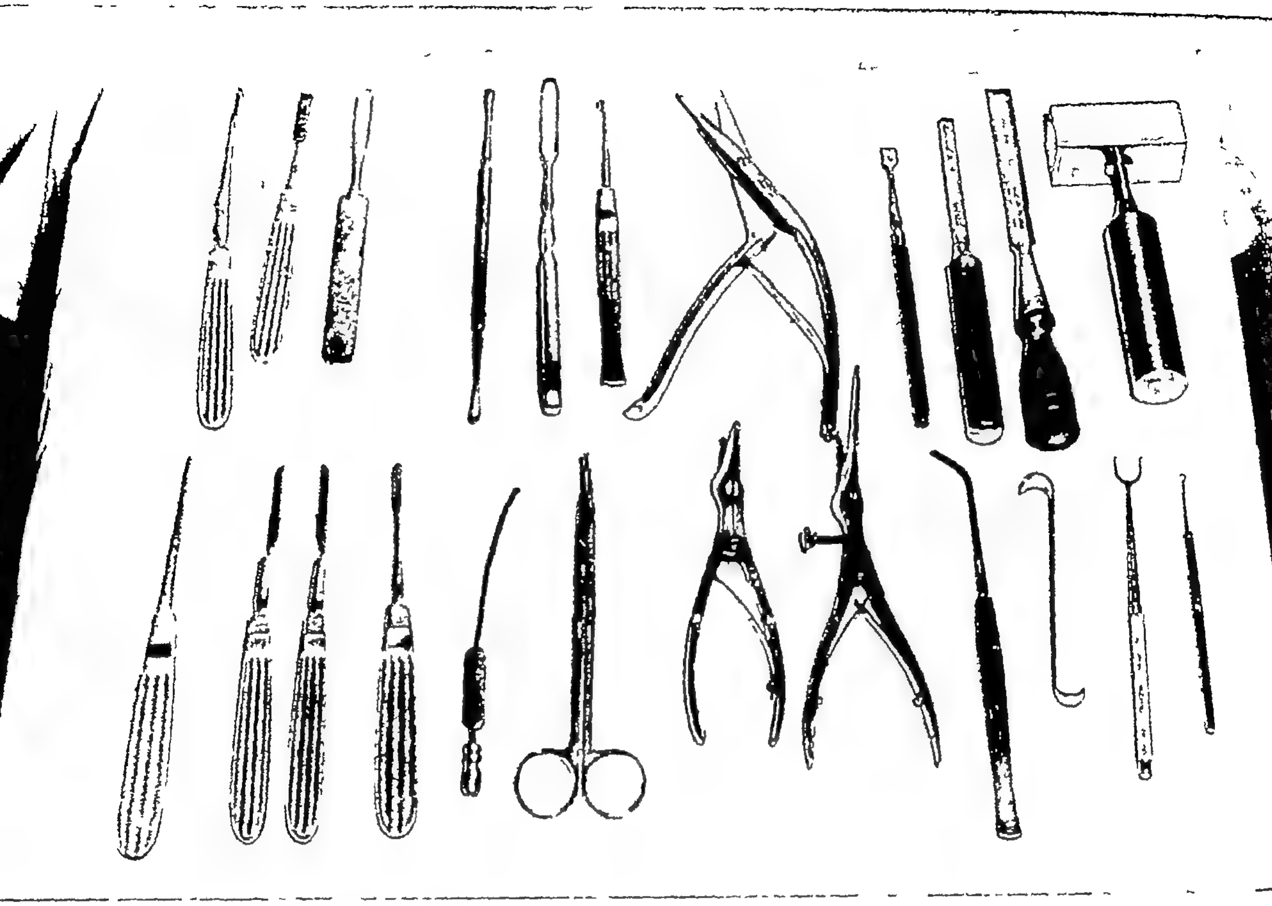


Figure 29 Commonly used nasal instrument setup *Back row,* from left, glabellar rasp, puller rasp, pusher rasp, septal elevator, swivel knife, septal knife, bone-cutting scissors, osteotomes, chisel, and mallet. *Front row,* from left, straight saw, pair bayonet saws, Joseph elevator, antral suction tip, right-angled scissors, nasal speculum, long septal speculum, golf-stick knife, S-ribbon retractor, and hooks

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Figure 30 Patient draped on special operating table, with position of small instrument tables and plaster cast shown (posed by Gloria Dieu, chief nurse in plastic surgery rooms at Barnes Hospital)

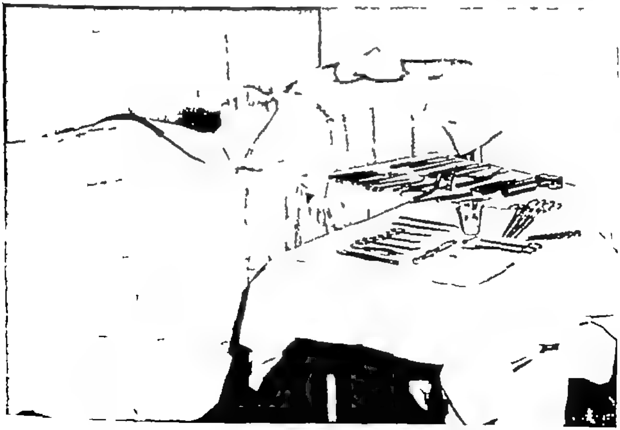
iodine solution A gauze flat may be draped over the patient s mouth but it is essential to have the entire face exposed at times during the operation

Suction using a straight pencil shaped tip is employed for visibility It is helpful to have the motor out of the room to avoid the noise and vibration

The two small instrument tables are grouped near the head of the operating table and the patient s cast is placed on an adjacent table On a plastic surgical service the operating room functions more efficiently if the scrub nurse remains clean and keeps her large table clean throughout the operative schedule. She can set up separate small instrument tables for each of the operations scheduled and drop any additional instruments on these tables if and when required With two operating tables in the same room separated by a screen it is thereby possible for the surgeon to progress from one operation to another with practically no loss of time This saving of hours in the schedule each day makes for better surgery as the entire personnel is less fatigued during the later operations

ANESTHESIA

Most nasal operations are best performed under local anesthesia with certain exceptions as noted in other chapters There is less bleeding the tonus of the features is maintained so that the nose can be better balanced with them and there is less likelihood of the nose being displaced during the immediate postoperative period.



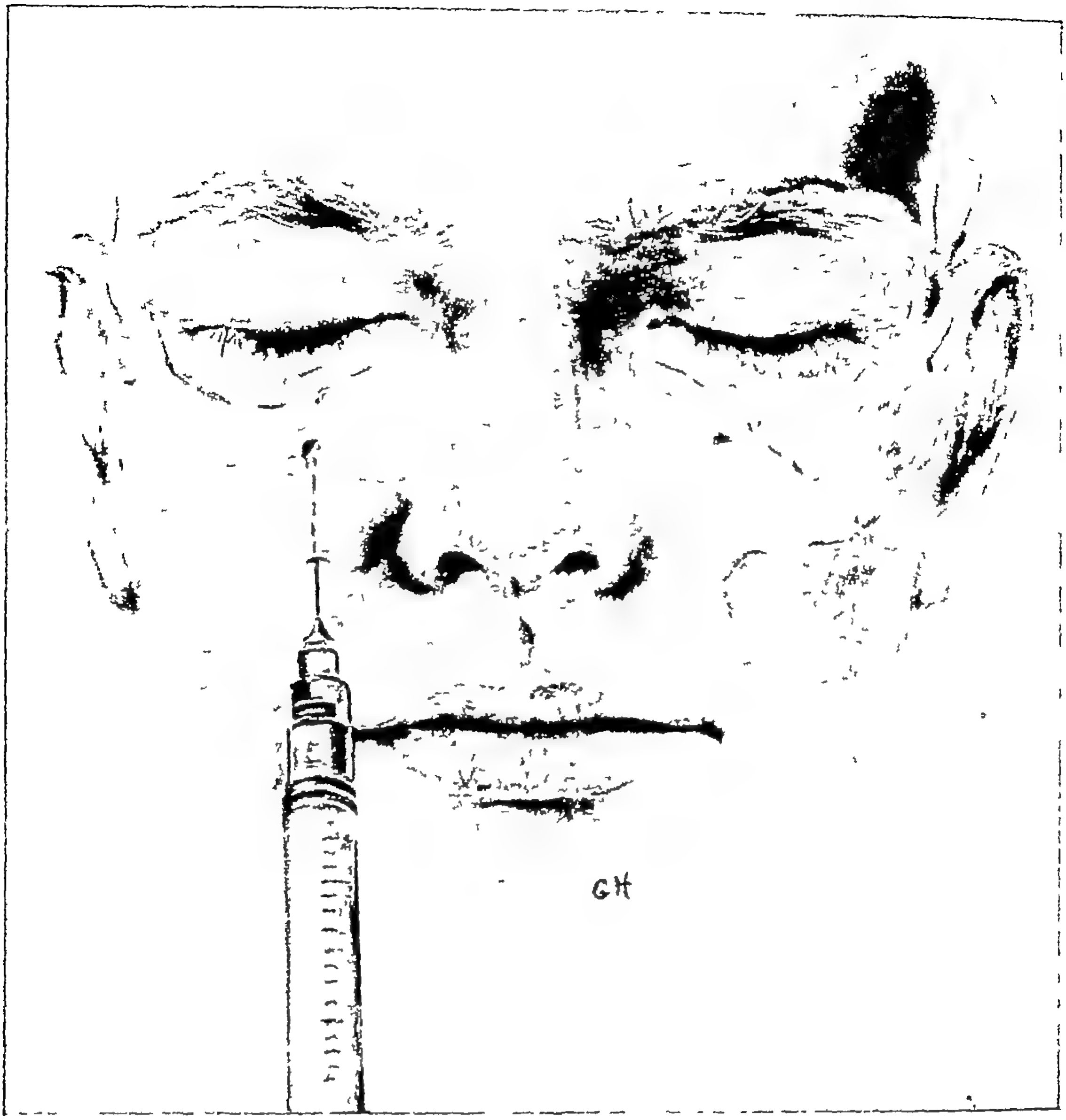


Figure 31 Technique of infraorbital nerve block with procaine

When general anaesthesia is necessary, the oral endotracheal method is used, packing the throat well to avoid aspiration of blood Suction is kept at the bedside and used during the anesthetic recovery period to keep the throat clear and maintain an airway through the mouth

For local anesthesia, 2 per cent procaine, containing 10 to 12 drops of adrenalin to the ounce, is preferred In this strength, 10 to 15 cc is sufficient to block the entire nose, and it is important not to distend and distort the nose too much with the solution A 2 cc or 3 cc syringe is used, as it is universally established that the smaller the syringe, the less solution will be used

A topical anesthetic may be used over the mucosa if desired This may be 2 per cent Pontocaine or other anesthetic of choice but cocaine is not used. If any topical anesthetic is used it is kept in an identified container and is discarded before the procaine injections are started so that there will be no confusion of solutions.

Procaine is injected first into the regions of the two infraorbital foramina (Fig 31) The needle is inserted a little more than 1 cm lateral to the alar base on a line just below the pupil when the patient is looking straight forward. The needle is angled superiorly so that it will strike the bone just below the orbital border Placing the tip of the opposite index finger on the middle of the orbital floor rim is helpful in estimating this point and in avoiding too high insertion of the needle It is not necessary to make a direct strike on the nerve about 3 cc of solution is injected in this area and allowed to diffuse The nasal anesthesia obtained corresponds approximately to the area of the lower lateral cartilage.

Following this the nasal spine is infiltrated inserting the needle outside the alar base and across under the nostril floor until the tip is near the spine (Fig 32) About 1 cc of the solution is deposited here and the needle may be carried across to the opposite floor and ala

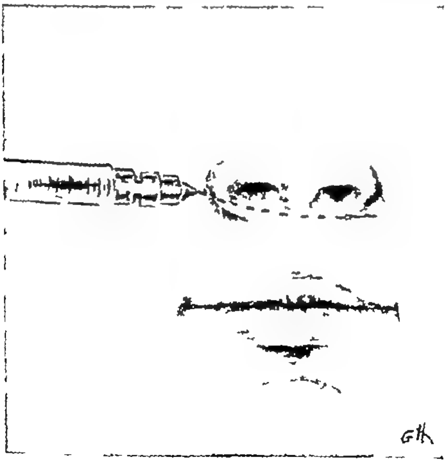


Figure 32. Infiltration across the nostril floors and base of the columella blocking fi division fibers in this area.

The upper and middle segments of the nose are anesthetized by infiltrating procaine between the framework and skin, inserting the needle through the nostril and between the upper and lower laterals (Fig 33) The needle is partially withdrawn and reinserted in different directions, injecting procaine ahead of it each time, until the entire area is infiltrated from one cheek to the other, and from the glabella down to the lower laterals

The quality of the procaine solution is important When prepared in accordance with the manufacturer's instructions, it is a very satisfactory anesthetic agent However, it can be weakened by autoclaving it too long, repeated autoclaving, or storing it too long Yellowish solutions are usually safe to use, but weak The large quantities used in some institutions are probably due to this, in such instances, pressure anesthesia is probably obtained rather than that due to direct action of the drug on nerve fibers and endings

True procaine reactions are rare, and are minimized by preliminary medication with barbiturates The use of small amounts of solution, slowly injected, is also a safeguard In case of a reaction, intravenous administration of sodium pentothal and oxygen therapy is recommended

Some patients will have an unusual sensitivity to the adrenalin This is manifested by palpitation, paleness, a feeling of being faint, and nausea The usual measures are to stop the injection and administer oxygen containing a little carbon dioxide, carefully watching the pulse, blood pressure, and respirations Further therapeutic measures are undertaken as indicated, but adrenalin is labile and the effect usually wears off in a few minutes If the condition of the patient then seems satisfactory, it may be possible to continue the injection cautiously with straight procaine solution (without any adrenalin) and then proceed with the operation

Because of this occasional sensitivity to adrenalin, it may be advisable to reduce the amount, do slower injections, or use preliminary tests on older patients and those with hypertension

Figure 33 Infiltration of the upper two-thirds of the nose between the framework and skin. The needle is inserted through the nostril, underneath the alar cartilage piercing the mucosa between the upper and lower lateral and then passing superficial to the upper lateral and bones The needle is partially withdrawn and reinserted in different directions until this entire area is blocked. The septum is blocked high on both sides.

SECTION 2

SURGICAL REDUCTION IN THE SIZE OF THE NOSE

Chapter IV

HUMP REMOVAL AND LOWERING OF DORSAL LINE

ALTHOUGH PATIENTS frequently request removal of a hump, it will be found in studying their noses and plaster casts that this alone seldom will give a satisfactory contour. Nearly always when the hump is removed the nose has the shape of a truncated cone too flat along the dorsum, and it is apparent then that the remaining side walls should be narrowed. This narrowing frequently gives character to the nose as an individual feature resting on the face, rather than the face spreading out from the nose hanging onto it.

Frequently after hump removal and narrowing the nose will appear too long and will require shortening (Fig. 34). At the end of this stage the nose may appear very much improved, except that the tip overbalances it and requires thinning and shaping. As stated before, it seems better to plan all of these stages in advance by study of the patient and a plaster cast (Fig. 35) rather than to try to improvise or to deal with each problem as it arises. In this respect, the reconstruction of a nose may be compared to remodeling a house—the final results are better if the plans are formulated in detail before the work is started.

In reducing the size of the large nose, the work can be described in the following stages: (1) hump removal or lowering of the dorsal line, (2) narrowing the nose, (3) shortening the nose, (4) reconstruction of the tip. The work is usually done in this order, but it may be changed as, for example, when the major deformity is a large tip it may be reconstructed before the bone work, or at least before narrowing the side walls.

In all operations, except some small tip adjustments, it is necessary to get thorough access to the interior of the nose through the following described opening incisions and completely to undermine the skin in order to allow the latter to be shifted and redraped over the new nasal framework. The ultimate success of any nasal cutdown depends upon skin elasticity and shrinkage so that it will conform to the new framework (Fig. 36). This means that larger cutdowns can be done more successfully in young patients with tight skin than in older patients with lax skin. It also means that larger cutdowns can be done in patients with thin, elastic skin over the nose that snaps back into place after being pinched up and released. Especial caution is used in attempting large reductions in size in patients with thick, stiff nasal skin with large pores sodden with sebaceous

plies to individual areas of the nose, as well as the whole nose If the patient has thin skin over a bony nose and thick skin over the tip, his skin may readjust to a moderate bony cutdown, but will probably not conform well to any extensive tip reduction In explaining this to a patient it may be compared to cutting off a tent pole, the tent will be lower but the covering will still be there and will either have to shrink up and conform or remain wrinkled If the covering were very thick, stiff material, the lack of conformity would be greater

Figure 34 Nose too large in all directions, dominating entire face Corrected by removing hump, lowering dorsal line, narrowing bones, shortening nose, and trimming height, width, and length out of tip cartilages, all in one operation

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Figure 36 Giant nose on a normal face, with surgical correction shown These noses should not be cut down too much because (a) any patient who has lived with a huge nose for many years is not likely to want a small nose, and (b) the vast amount of skin may not contract enough to conform smoothly to a small framework

Figure 35 Same patient as Figure 34 showing removal of bulk from tip and plaster cast used in preoperative planning of entire reconstructive procedure. The pleasing triangle from below is necessary for the best result.

The importance of the subcutaneous tissue has not been stressed in the literature, but many deformities are entirely or partially dependent upon excessive amounts or irregular collections of fat, connective tissue, or muscle under the skin. The lack of any definitive angle between the nose and forehead (the Grecian type profile) is more frequently due to a soft tissue bridge over the glabella than to bone. Wide or cleft tips are often due to masses of fat and connective tissue between the two lower lateral cartilages. The nose which is thick, rounded, and heavy in appearance in the lower two thirds (the so-called potato nose) may be so because of excessive subcutaneous tissue over both the upper lateral and lower lateral cartilages, or because of thick skin, or because of some combination of these factors. **Operations upon the bony or cartilaginous framework will not correct these soft tissue deformities.** If subcutaneous tissue is to be removed, the undermining of the skin is made thin so that this tissue will remain on the surface of the bones and cartilages where it is accessible for removal.

OPENING INCISIONS AND UNDERMINING OF SKIN

The interior of the nose is exposed and the lower edge of the upper lateral cartilage is brought into view, so the demarcation between it and the upper edge of the alar cartilage can be seen by elevating and stabilizing the tip with thumb and fingers of the left hand.

The opening incision is made with the tip of a No. 15 blade punched in between the upper and lower lateral cartilages posteriorly, and the cut made forward toward the dorsum and tip to separate the two cartilages, the blade sliding between the upper lateral cartilage and the overlying skin (Fig. 37). As the cut reaches the dorsum of the nose, the lower edge of the upper lateral cartilage joins the tip angle of the septum and the cut swings toward the tip. The tip of the blade is then pushed through the membranous septum to the other side, to separate the cartilaginous septum from the columella (the columella, of course, contains the vertical cruces of the alar cartilages). The columella is cut loose from the septum by continuing this through-and-through incision down to, and passing in front of, the anterior nasal spine (Fig. 38).

This entire initial incision describes an arc, somewhat like an inverted U, with one limb between the upper and lower laterals and the other limb between the septum and columella. The same incision is made in the other nostril and is carried around to the columella where it meets the first incision. The separation of the columella from the septum can be omitted only if it is not intended to shorten the nose. Older incisions which opened through the skin of the nose or columella are of no value in this operation. Skin excisions are a different consideration and are referred to later.

Undermining of the skin is done with a curved, slender scissors (about $5\frac{3}{4}$ inches in length). These scissors are of the best quality and are kept

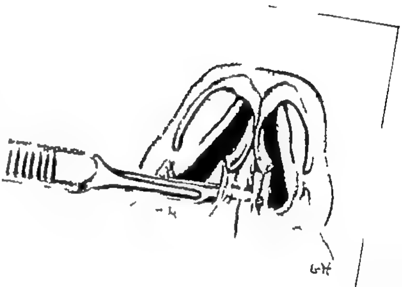


Figure 57 Opening incision The dotted line is the boundary between the alar and upper lateral cartilages, and the lateral limb of the incision is made here with a No 15 blade A sawing motion is used to make the depth of the cut the full length of the blade

Figure 58. Opening incision continued. The tip of the blade is now swung through the tip of the nose and downward through the membranous septum completely detaching the cartilaginous septum and nasal spine from the columnella. Figures 57 and 58 illustrate one continuous incision.

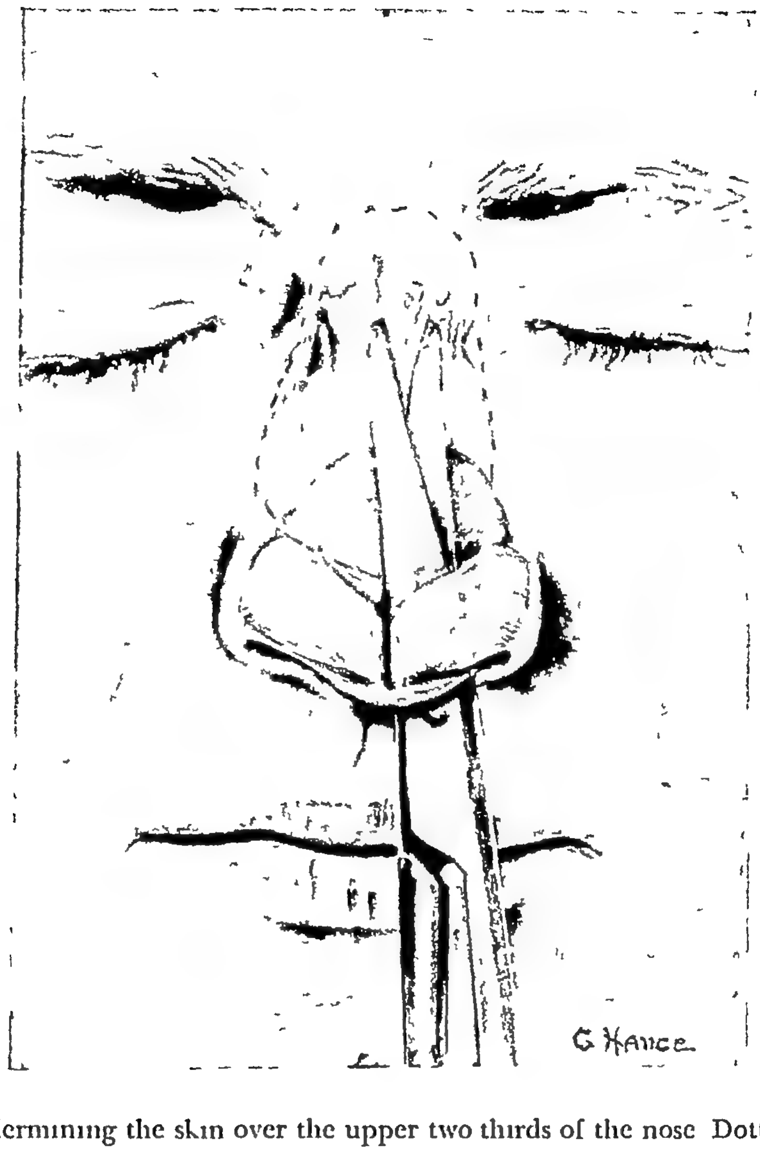


Figure 39 Undermining the skin over the upper two thirds of the nose Dotted line represents approximate extent of undermining A good scissors technique seems better than a double-edged knife here

Figure 40 Undermining the skin over the tip of the nose In practice, the nostril wall is held between the thumb and fingers of one hand to steady it and guide the scissors. Patient gentle spreading and dissecting are necessary to get a good plane between the alar cartilages and skin

sharp and set so that they will cut cleanly and easily all the way out to the points The points are slightly rounded and the back edges are not sharp enough to cut the overlying skin

The scissors are inserted through the mucosal incision between the upper and lower lateral cartilages and the skin is undermined thinly by a combination of spreading and dissecting (Fig 39) The skin is undermined over the entire nose, down over the frontal processes of the maxillae on each side without residual bands of attachment, until the scissors can be passed back and forth from one frontal process over the dorsum to the other frontal process without meeting resistance If it is desired to "sink in" the angle between the nose and forehead, the undermining is carried up between the frontalis muscle and skin over the glabella

To free the skin over the alar cartilages, the nostril wall is held between the thumb and fingers and is everted as much as possible The scissors is then introduced through the opposite nostril and swung around until the tips will dissect downward over the surface of the alar cartilage that is being held (Fig 40)

Undermining with double-edged nasal knives has been described However, they are more likely to puncture the skin and they do not follow the planes as well as scissors There are also various knives for several maneuvers, but simple equipment kept in the best condition seems best

INCISING THE PERIOSTEUM OF THE HUMP

The Joseph nasal periosteal elevator (Fig 41), one of the most useful instruments in plastic surgery, is used for this It should be hand-forged in stainless steel of good temper and be sufficiently strong that it will not bend in the handle or shank Both side-edges as well as the tip-edge are sharp and are so respected

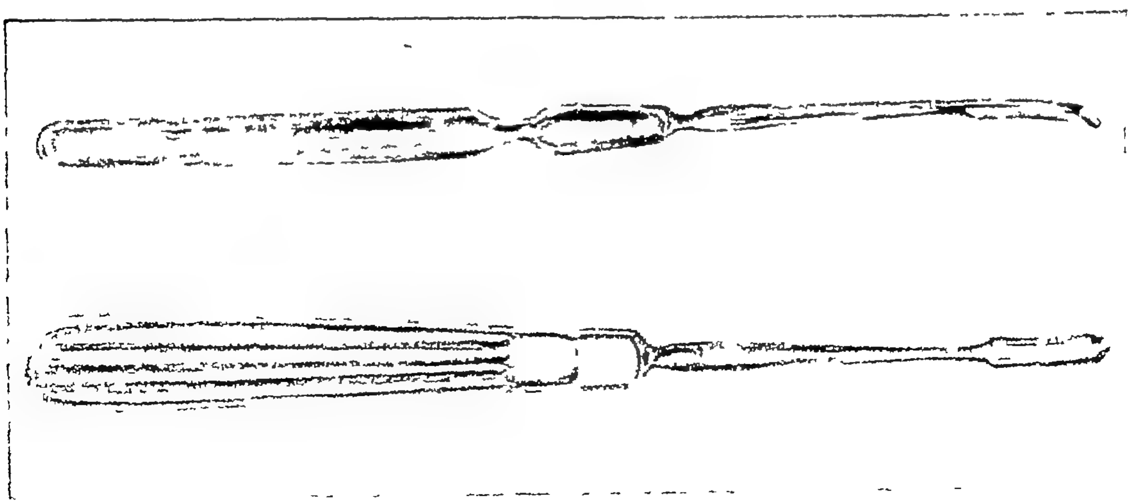


Figure 41 The Joseph nasal periosteal elevator, one of the most useful instruments in plastic surgery

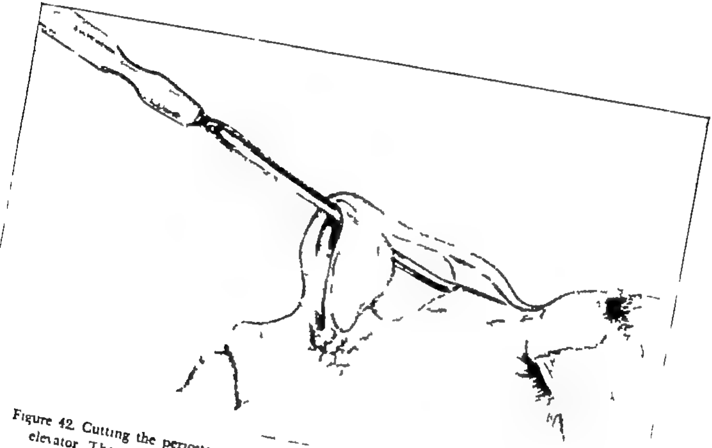


Figure 42. Cutting the periosteum along the lateral line of hump removal with Joseph elevator. The periosteum is pushed up onto the hump for later removal with it.

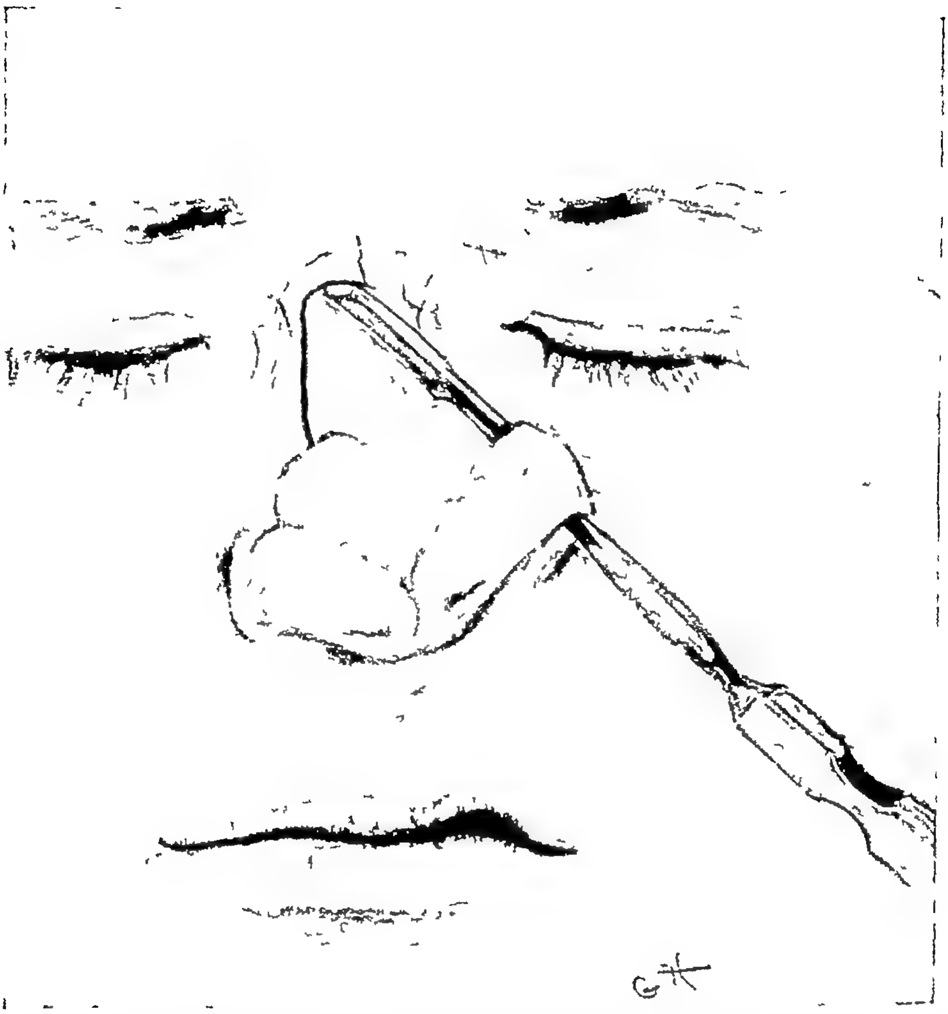


Figure 43 Cutting across the periosteum and frontalis muscle at the top of the hump with the Joseph elevator These tissues are then scooped down onto the hump for lateral removal with it Aquiline and Grecian deformities may be produced by soft tissue in this area, and it is removed to procure a definitive glabellar angle

By study of the nose and the cast the amount of hump to be removed is visualized The Joseph elevator is then introduced through the left nostril over the upper lateral cartilage and nasal bone at this level As it is shoved in with pressure against the lateral wall of the hump the sharp edge of the elevator cuts through the periosteum a little closer to the face than the line of the hump removal (Fig 42) By a twisting motion the periosteum and other soft tissue along this line are elevated toward the dorsum of the hump for later removal with it. The same procedure is followed on the right side

The tip-edge of the elevator is then used to open the soft tissues across the top of the hump at the level of the new nasal angle (Fig 43) There is usually some muscle and subcutaneous tissue in addition to the periosteum at this level so that moderate force is required to complete this cut The soft tissue over the new nasal angle is then scooped downward onto the dorsum of the hump for later removal with it

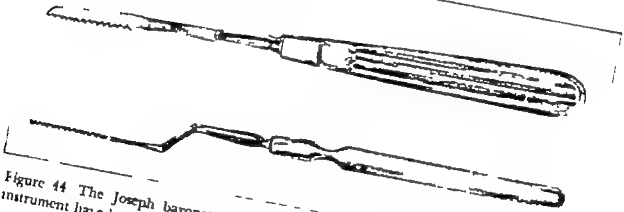


Figure 44 The Joseph bayonet nasal saw Although many bizarre variations of this instrument have been designed, the pattern shown is mechanically and surgically correct

HUMP REMOVAL

The Joseph bayonet nasal saw (Fig 44) is much superior to chisels formerly used for this purpose In addition to being of good steel temper and workmanship it should be of the proper pattern with the offsets of the blade and shank both entirely in the vertical direction and not any in the horizontal direction In use the blade is hidden in the nose and it is important that the saw be so constructed that the blade acts as a straight extension of the handle and the operator can sense instinctively just where the blade is at all times As in all cutting instruments the closer the handle approaches the cutting part in shape and direction the more accurate the work can

Many modifications of this saw with various bizarre horizontal angles have been made but the plain straight bayonet pattern is mechanically and

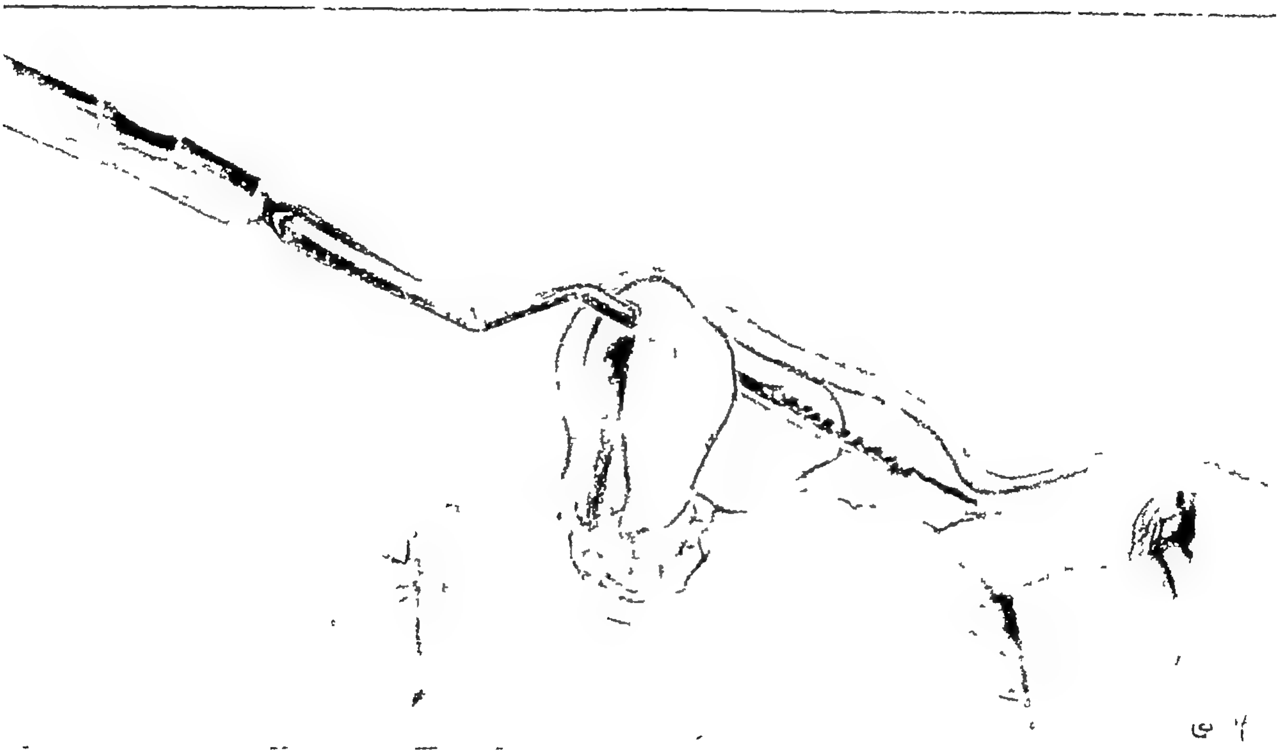


Figure 45 Sawing off a hump, along the line previously determined by study of the patient and a plaster cast of his face At first, the saw is carefully placed and guided by the fingers of the opposite hand through the skin, until the groove is started

Figure 46. Front view of sawing off a hump. By working the tip of the saw across the top of the hump early, the entire hump can be removed by sawing from just one side.

surgically sound The addition of a knife-heel to the saw blade is dangerous and not helpful Several efforts have been made to design an electrical saw for this purpose, some of which may be successful It would seem that the same Joseph blade mounted on a reciprocating mechanism would insure straighter cuts than a rotary saw, and we are having this instrument made

The bayonet saw is introduced through the left nostril over the upper lateral cartilage and nasal bone with the offset in the shank so that the blade is up and the handle is down (Fig 45) Before sawing, the blade is carefully placed against the side of the hump along the predetermined line and its position checked by feeling it through the skin The cutdown of a cast, photo, or profilometer cannot be translated identically as to the amount of skeletal hump to be removed—allowance must be made for subcutaneous soft tissue on the surface of the hump, and also for the thickness of the saw cut Aquilinity can be produced entirely, or in part, by this soft tissue—and in doubt, it is better to remove too little bony hump than too much At this stage one is again reminded that a person who has had a big nose does not want the appearance of a retruded face

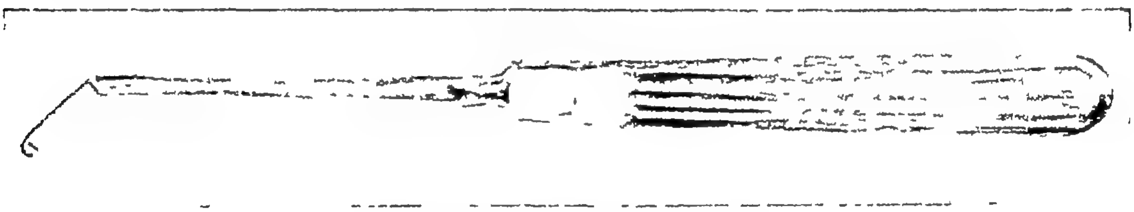


Figure 47 Nasal drawing knife

The hump is sawed completely across by one continuous cut In order to do this, it is necessary to get the tip of the saw across first, and then saw somewhat diagonally until the heel comes through (Fig 46) This technique is superior and gives a smoother dorsum than the old technique of sawing through one nasal bone from each side The upper part of the hump consists of bone and the lower part of cartilage The saw is used to cut through all of the bone and part of the cartilage, the remainder of the cartilaginous hump being sliced off with a drawing knife (Figs 47 and 48) Care is taken to avoid injuring the columella The hump is then lifted out intact with a mosquito forceps (Fig 49) and inspected as to amount and as to regularity of the cut surface

If the original saw cut did not remove quite as much hump as desired, or if the removal has been a little lower through one bone than through the other, a small amount of bone may be rasped off with the "pusher" rasp (one with the blades set forward so that it cuts when pushing it forward and down, Fig 50*A*) However, it is always better to get straight, smooth saw cuts through the right place the first time

Figure 48 Completion of removal of cartilaginous portion of hump with the drawing knife

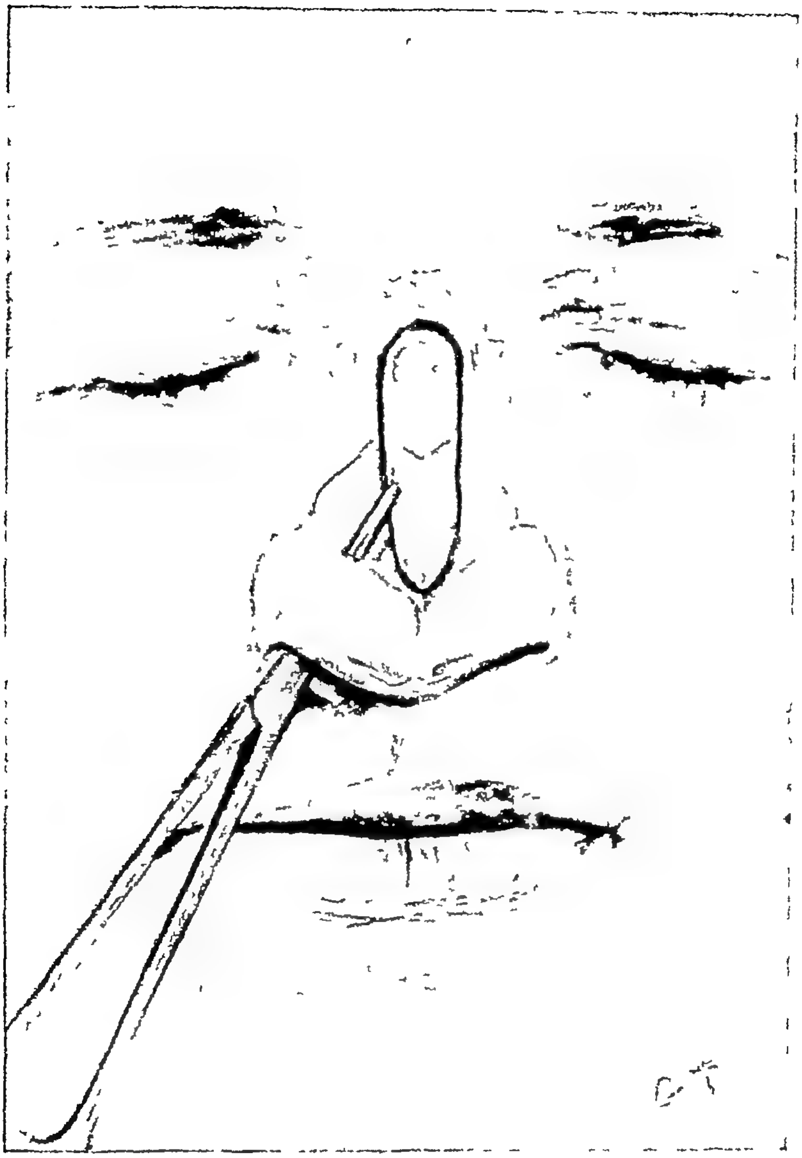


Figure 49 The hump may now be extracted with a mosquito forceps, and the new dorsal line of the nose checked

In rare instances of a Roman bony hump which extends up above the new nasal angle there will still be a bony attachment above after sawing through If this will not fracture easily it is detached above with a slender curved chisel and the new nasal angle region smoothed down a little with the Aufricht glabellar rasp Occasionally a small chisel is let in through a puncture wound on one side of the glabellar region and the bone detached with it if there is excessive solidity or thickness in the region

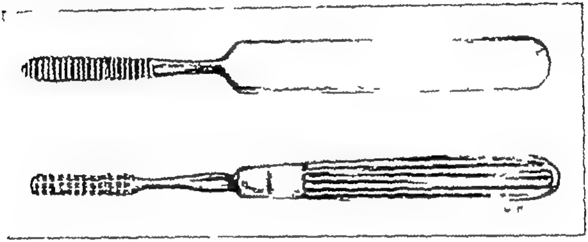


Figure 50. Nasal rasps. *Above* pusher rasp for cutting down bone. *Below* puller rasp for smoothing edges and cleaning out debris.

After removal of any hump it is desirable to remove sawdust and chips with the "puller rasp (one with the blades set backward Fig 50B) This instrument is more efficient as a rake or cleaner than as a rasp but it is also used to round off the rather sharp sawed edges of the bones (Fig 51) Suction can also be used for *cleaning by moving the suction tube around* while the skin is held up off the bones. A blunt curette also may be used

Any lateral bosses on the sides of the nasal bones can be smoothed off with the rasps after the hump is removed Cleaning of chips and sawdust is always done after any cutting

After removal of the hump the cut surface of the nasal bones and the entire dorsal line of the septum are inspected by direct vision The nostril is lifted up with the S-ribbon retractor (Fig 52) and the upper lateral cartilage is seen and cut loose from the septum at the lower end *hugging* the septum as close as possible (Fig 53) The same is repeated on the other side and then the tip can be lifted upward and forward to expose the new septal dorsal line as high as possible. By inspecting the *dorsum of the septum* any irregularities can be noted and shaved down with a No. 15 blade (Fig 54) Any extra fragments of mucosa along the dorsum of the septum are trimmed off flush to the cartilage with a fine curved scissors The septum is part of the armature (or framework) of the nose and as such forms the

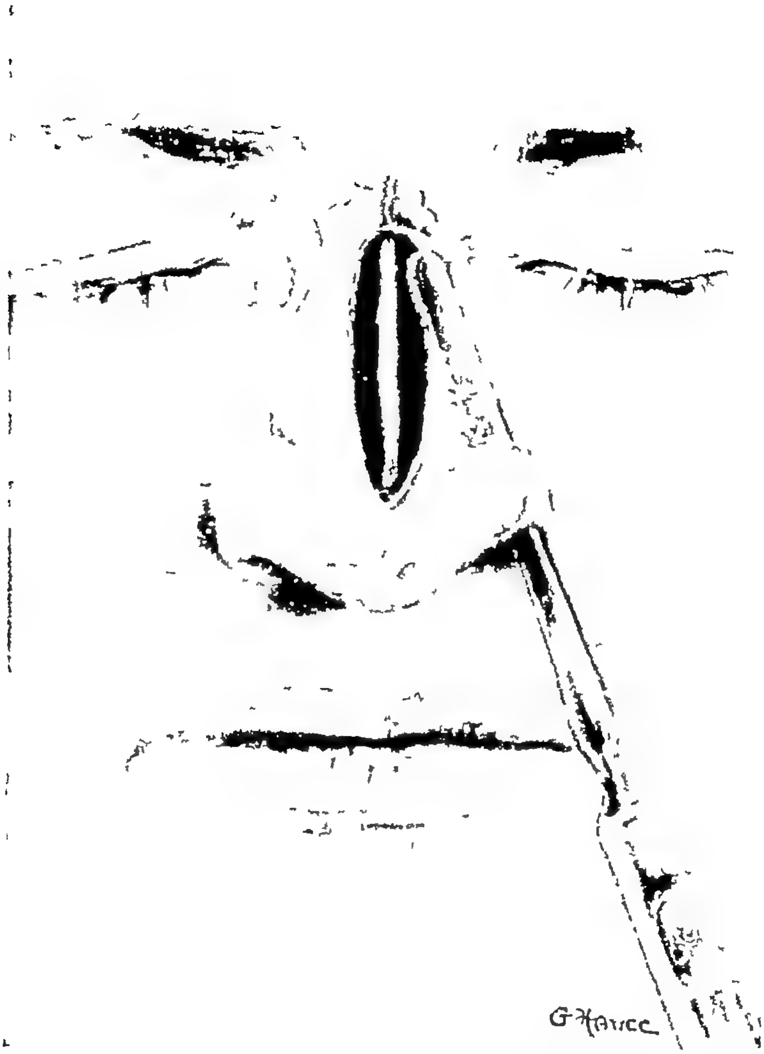


Figure 51 Smoothing the edges of the saw cuts with rasps These may also be used to file down any bosses on the side walls

Figure 52 S ribbon nasal retractor

Figure 58 Cutting the remaining attachment of the upper lateral cartilages from the septum In practice this is done under direct vision retracting the nostril up to see the field from below

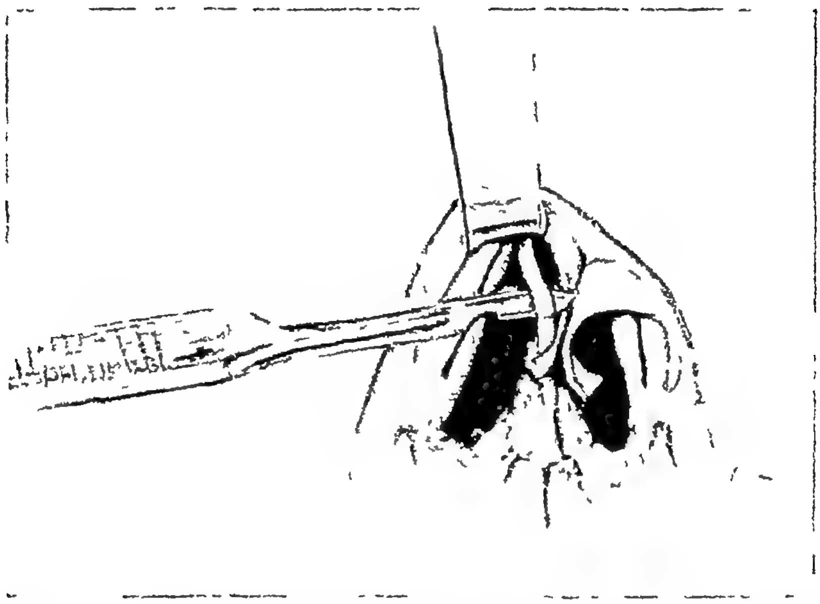


Figure 54 The tip is retracted upward, and the entire dorsal line of the septum is inspected Any irregularities are shaved off with a No 15 blade knife

new dorsal line of the nose It is painstakingly trimmed until it forms a clean straight, narrow line in the angle desired

FURTHER CONSIDERATIONS OF HUMPS

The long curved hump extending from nasal angle to tip is thought to be familial or racial in origin (Fig 55) It is thus often termed congenital, although it seldom appears until adolescence or later and then slowly grows worse as the patient grows older Such a hump may be superimposed over a normal profile line (Figs 56 and 57) or a retruded profile line (Fig 58) or over a high profile line (Fig 59) It may be uglier than one produced by a fracture (Fig 60) the owner may be more unhappy and there are many medical social and psychological reasons for the surgical correction of it.

Figure 55 Long curved hump generally thought to be familial or racial in origin Complete correction involves removal of hump narrowing and shortening nose and reconstruction of tip cartilages.

Figure 56 The surgical correction of these "congenital" deformities is just as worth while from every aspect as in traumatic deformities Pleasing triangle by reconstruction of lower lateral cartilages without rim incision

The shorter humps which are localized to the upper or middle thirds of the nose are usually the result of old fractures—often from early childhood (Fig 60) One fracture is particularly prone to produce such a hump—the depressed, dorsal-chip fracture of the nasal bones during the growing period Such a chip seems to irritate the septum as would a foreign body and the septum overgrows in an apparent attempt to extrude it (Fig 61).

Figure 57 Long sloping hump over a normal profile elevation of [illegible] Correction in one operation.

Figure 58 Long sloping nose with original retruded profile line of 28. Profile angle elevated to 36 in correction

Humps can also be produced by fractures in adult life with gross displacement of sizable segments of nasal bone (Fig 62) These are often attached only by a springy fibrous union and may remain tender for a considerable period It is possible that the Roman nose was this type because the Roman sculptors usually had soldiers for their subjects who probably had sustained battle injuries in winning their laurels

The surgical difficulties in removing a hump are inversely proportional to the size of it (Figs 63, 64, and 65) Small humps may be reduced to nothing but sawdust in the process of their removal Nevertheless, it is generally better to remove even small humps with the saw than with rasps After the removal of even a small hump, the new dorsum will be flat and wide, and the nasal bones are narrowed, as outlined in Chapter V There may be instances of not narrowing the side walls but these are rare and the rule should always be considered In an acute fracture a chip may get turned up, and it can be simply removed without the necessity of narrowing

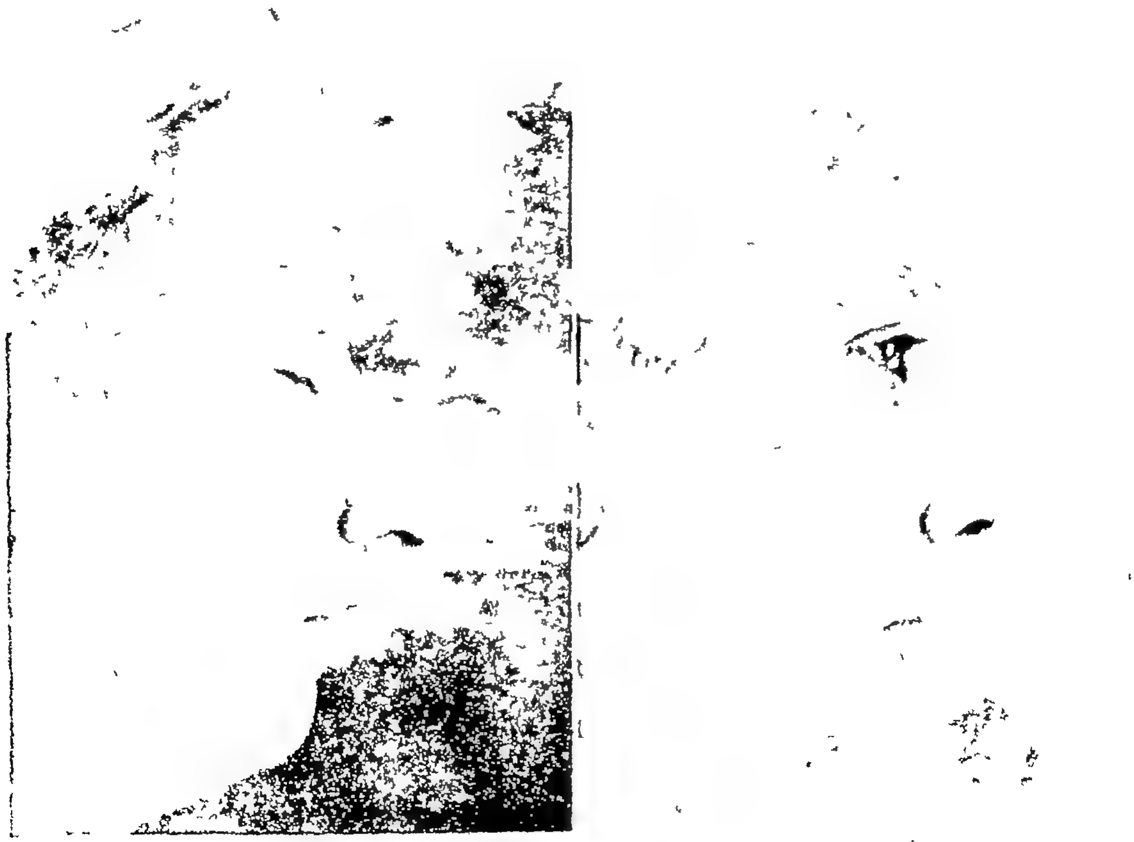


Figure 59 High hump with a high original profile angle of 40°, so tha[illegible] pletely dominates other features Correction makes slight retrusion of chi[illegible]

Figure 61 Hump from a fracture, superimposed on a low profile line of[illegible] involved elevation of profile angle to 37° and shortening nose from an [illegible] of 88° to a new lip angle of 112°

Figure 60 Bony hump from an old fracture sometimes called a Roman nose. Even in these correction involves narrowing and shortening the nose and reconstruction of the tip cartilages, as well as hump removal.

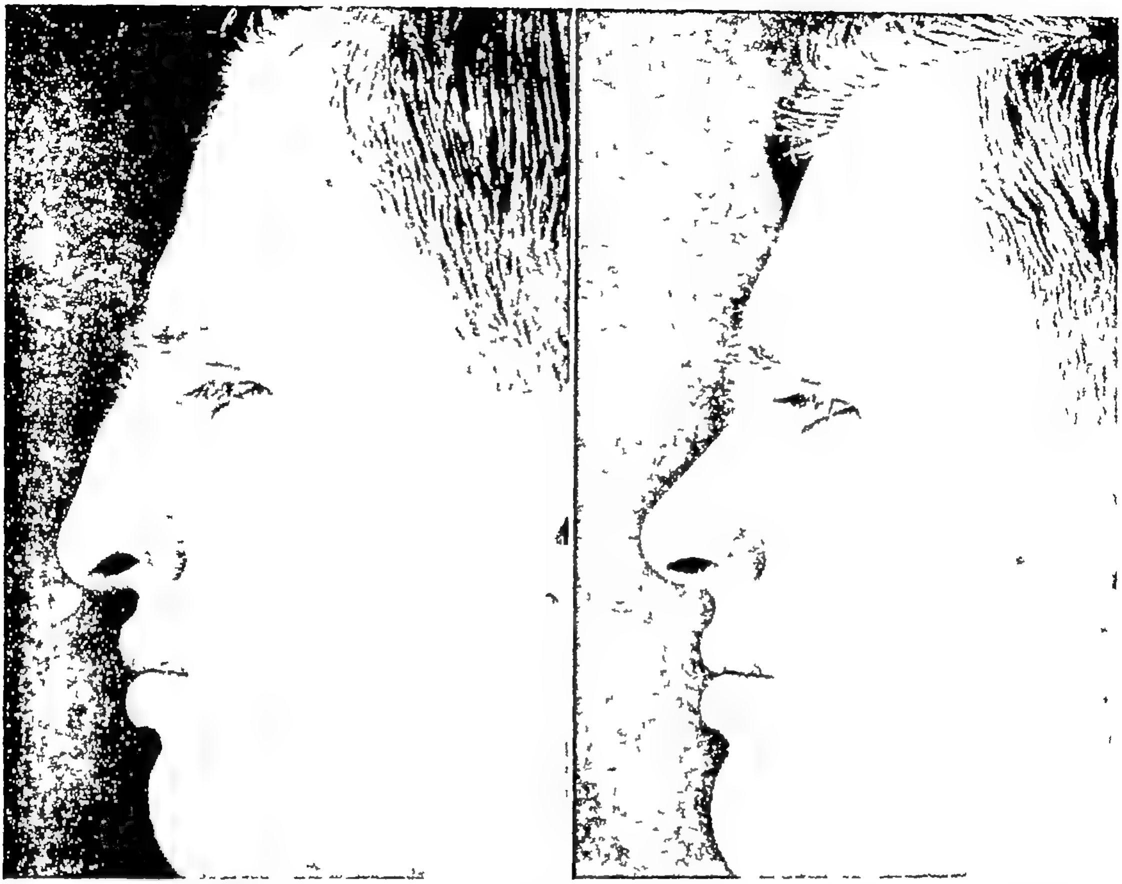


Figure 62 Roman deformity due to an old fracture Original dorsal elevation of 25° elevated to 38° Original columellar-lip angle of 73° opened up to 90° by shortening the nose Correction makes the whole face appear shorter and more rounded

Figure 63 The most difficult surgical procedure is the correction of multiple tiny irregularities, as in this patient. Dorsal line was straightened tip elevated slightly nose shortened a little, nasal bones narrowed, nostril walls thinned, and bulges removed from alar cartilages. All changes were small but the total effect was quite improved.

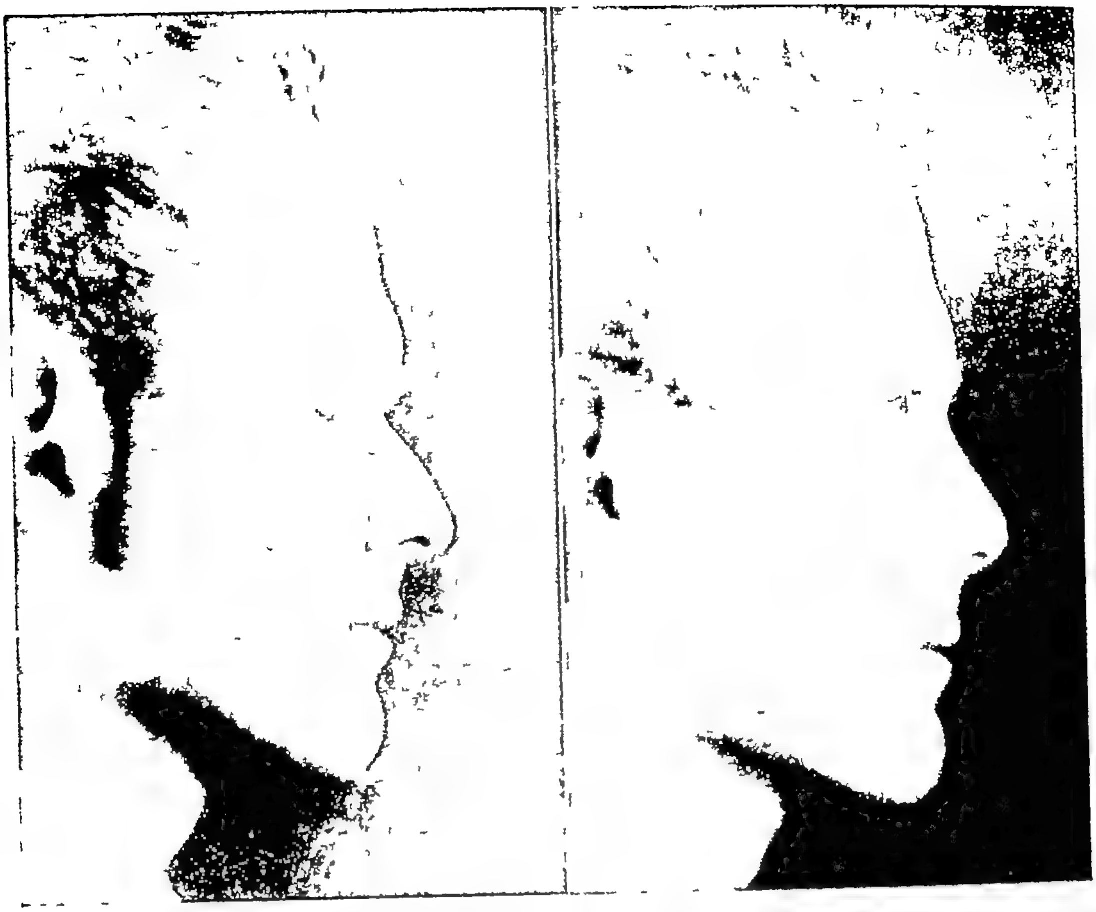


Figure 64 Unposed clearing of expression as an economic move for professional reasons

Figure 65 General refinement of nose by multiple small surgical corrections throughout

Figure 66 Giant nose on a small girl with original dorsal angle of 45 reduced to 38°
General effect of protrusion of middle third of face lessened.

Figure 67 Very large nose with the skin so distended that part of the upper lip has been pulled up into it Apparent increase in length of lip following reduction of nose to normal size

Figure 68 Reduction in size of giant nose with elimination of droop and hump

LOWERING THE DORSAL LINE IN LARGE AND GIANT SIZED NOSES

Operations are frequently indicated for excessively larger noses which may be fairly straight with little or no hump (Figs 66 and 67) The periosteum and soft tissues are cut around with a Joseph elevator and piled up on the dorsum in the same manner as described previously The dorsal line is then lowered by sawing off an anterior segment of the nose but in this instance the removed segment will usually be longer than the ordinary hump The other operative maneuvers are essentially the same as outlined under hump removal However the surgeon must remember that it is the degree of change that the patient notices and the patient who has had a giant sized nose is more likely to be pleased with a slightly large nose (Fig 68) than with a retruded nose

If there is too much thick heavy skin as mentioned in other sections there may have to be some skin excision if the best result is to be obtained It may be considered that any nose that is thus large should be let alone and this would be best for the operator but the individual patient is given fullest consideration of his requests and needs

Chapter V

NARROWING THE NOSE

AFTER THE HUMP IS removed or the profile line lowered, the dorsum appears wide and flat To relieve this truncated cone appearance, the bony side walls are set in and excess width and bulk of the upper lateral cartilages are reduced (Figs 69 and 70)

The first step in this procedure is to prepare further the dorsum of the nose so that there is a space between the lateral walls of the nose and the septum on either side This makes room for the dorsal edges of the walls to be moved inward toward the septum to make a smooth new dorsum

Figure 69 Softening of expression by narrowing nose and reduction of Cyrano like tip

In preparing the upper lateral cartilages, the nostril is retracted upward (Fig 71) and the fat and connective tissue are dissected off the outer surface of each upper lateral cartilage with scissors This will often reduce a nose which is bulky in the mid-section (the so-called potato nose), and will help keep down postoperative swelling and thickness in other noses

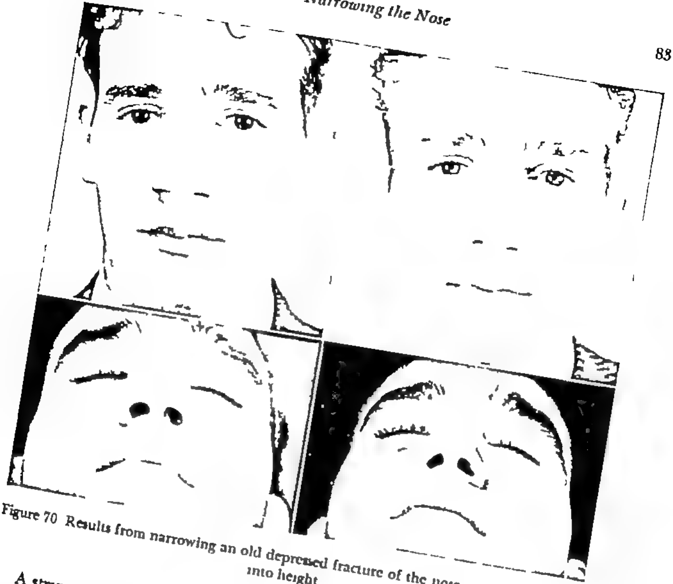


Figure 70 Results from narrowing an old depressed fracture of the nose, converting width into height

A strip is then trimmed off the length of the medial border of the upper lateral cartilages equal to the amount of narrowing desired in the mid section of the nose (Fig 72)

Some final loosening of the nasal bones from the septum up at the angle may be necessary so that the bone will hinge from the angle region when the nasal bones are moved inward rather than from any lower point. This usually is done with a short single cut on both sides with a small osteotome (Fig 73) If this region is excessively wide it may be desirable to make two parallel cuts 1 to 2 mm apart with the osteotome on each side and then to remove the tongue of bone between the cuts with a straight mosquito forceps This high loosening may be done immediately after the hump is sawed off (Fig 73) or any time later before fracturing in the bones

The best way to move in the bony side walls is to saw the frontal processes of the maxillae loose from the face on either side and then fracture the remaining high attachment at the glabella inward so the side walls are

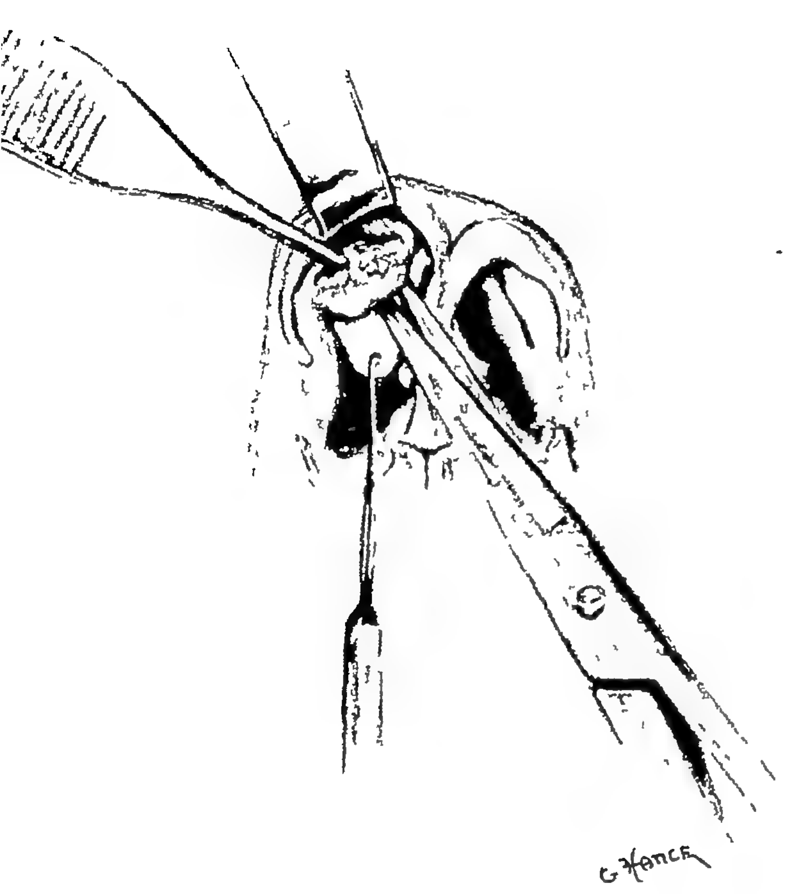


Figure 71 Removal of excessive soft tissue from outer surface of upper lateral cartilage to to thin the midsection of the nose

Figure 72 Excision of a strip of cartilage from the medial edge of the upper lateral to thin the midsection of the nose

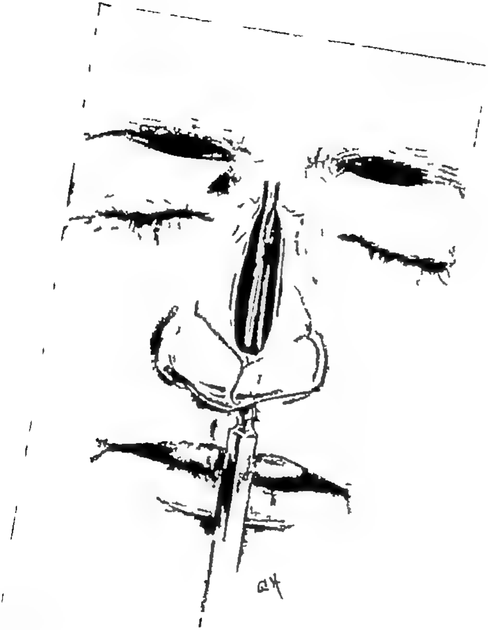


Figure 13 Loosening the upper ends of the nasal bones from the septum above the area of hump removal.

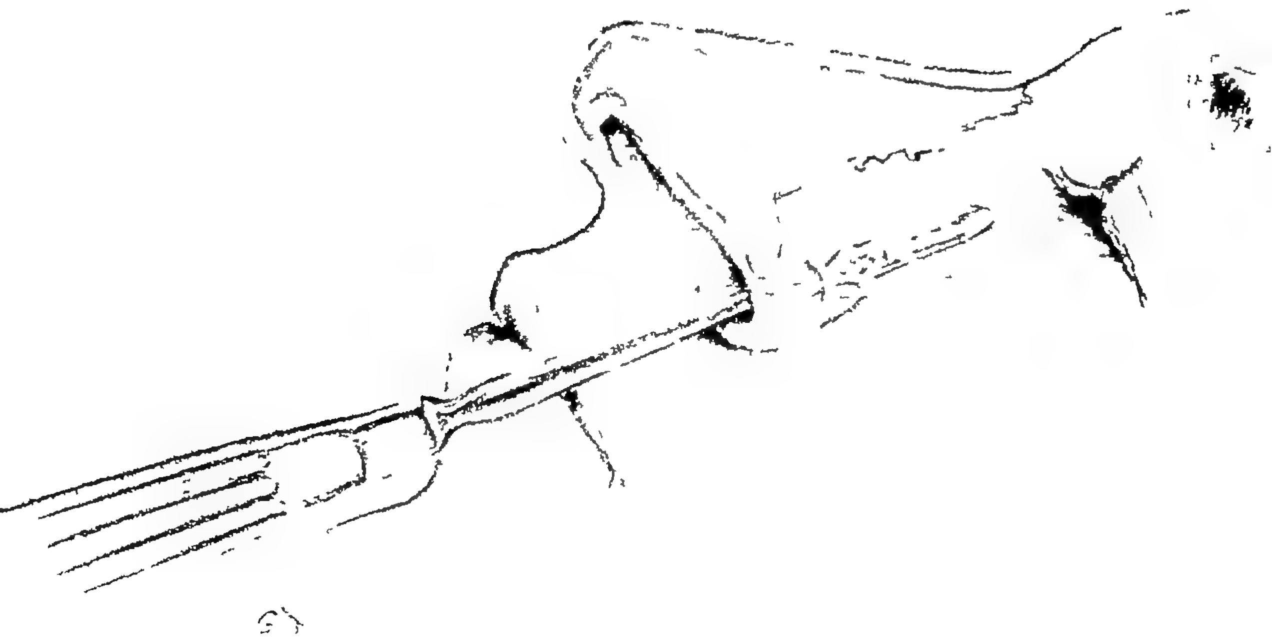


Figure 74 Stab opening in pyriform recess for introduction of elevator and saw

Figure 75 Elevating a tunnel of periosteum along the frontal process flush with the face this tunnel should extend higher than shown, up to the level of the angle of the nose

Figure 76 Profile view showing lateral saw cut through the frontal process, flush with the face.

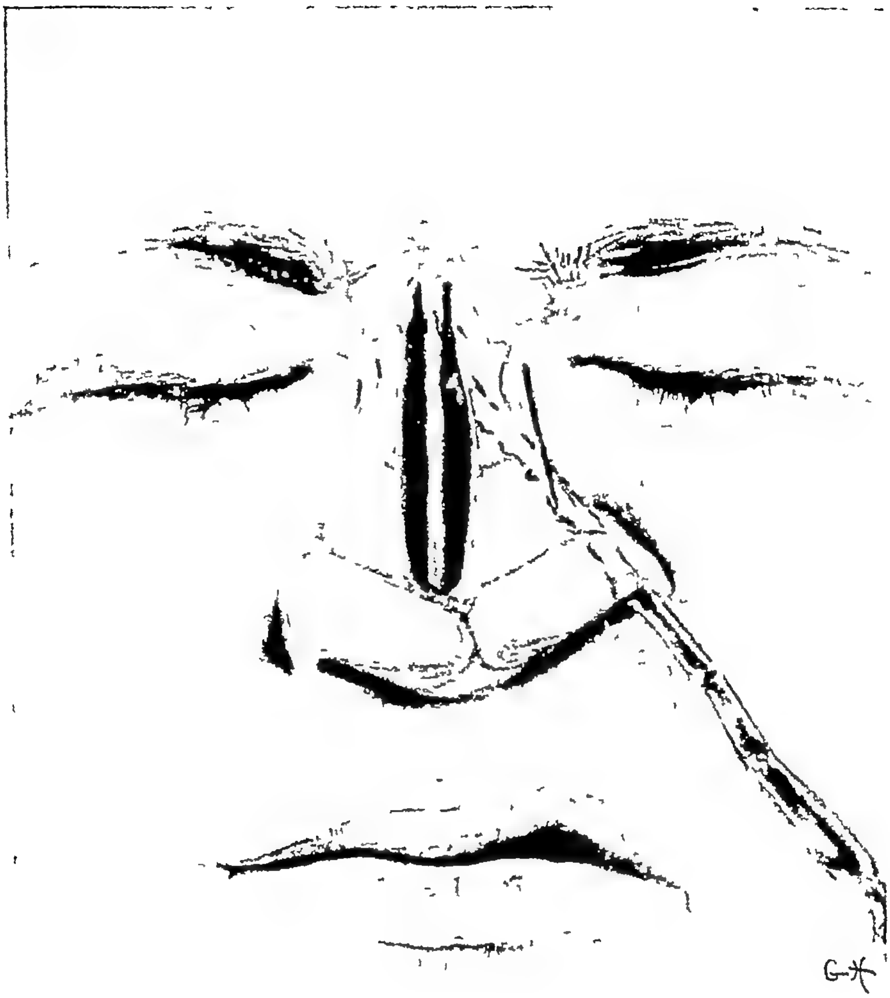
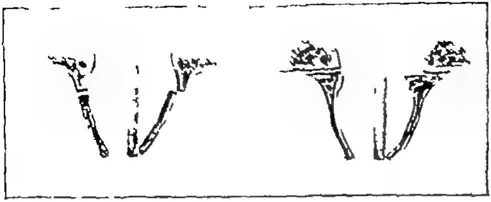


Figure 77 Front view showing lateral saw cut, the tip of the saw is worked through first



A *B*

gure 78 Diagrammatic cross section through bony part of the nose to illustrate move-
ents of bone in narrowing the nose *A* When lateral saw cuts are flush with the face,
ey are thicker so that bony surfaces are still in contact after narrowing and there is no
irstep deformity *B* If saw cuts are made higher from the face through thin bone
rrowing may leave stairstep deformity and even result in non-union from lack of con
tact.

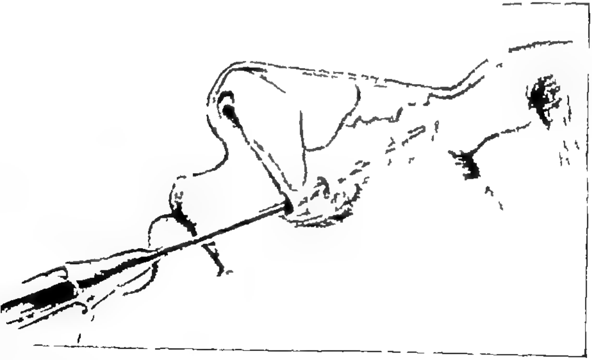


Figure 79 Use of long thin curved osteotome to clear line of saw cut.

moved inward toward the septum To introduce the saw, a stab incision is made with a No 15 blade in the pyriform recess just inside the nostril base (Fig 74), placed so that it will not approach either end of the initial incision The tip of the Joseph elevator is inserted around to the outer surface of the frontal process flush with the face, and then worked upward alongside the frontal process to elevate a tunnel of periosteum as high up as the level of the nasal angle (higher than shown in Fig 75)

The elevator is used to guide the proper bayonet saw into the opened channel along the side of the nose against the bone, after which the elevator is removed The same type of bayonet saw that was used for the hump removal seems best Here it is used with the blade down and the handle up (Fig 76)

The blade of the saw is carefully applied against the frontal process of the maxilla, which is the side wall of the nose, flush with the face, its position is ascertained by the "feel" of the saw as it is moved around, and also by feeling through the skin with the fingers of the other hand This low, flush position of the saw is important, as otherwise the saw cut will leave a ridge deformity (Fig 78)

The frontal process is then sawed through its entire length (Fig 76), getting the tip of the saw through first and then gradually working through the bone from above downward until the heel of the saw goes through last (Fig 77) It will be found that the thickness of the bone is much greater in this low, flush position than if one sawed through the thin bone at a level farther forward However, this thickness of the saw cut allows one later to slide the upper platform of bone part way medially across the lower platform of bone, in narrowing the nose Thus, at the conclusion of the narrowing, bones may still be in contact at the saw-cut level, if the level had been farther forward through the thin bone, at the time of narrowing the bones would have been separated (Fig 78)

The saw is removed and if the saw cut did not extend all the way up to the angle, or if there are any remaining spicules, a thin curved osteotome may be used to complete the bony opening (Fig 79)

The bones are separated along the midline on each side of the septum with a fine chisel during the preparation of the dorsum or at this point in the operation This chisel may out-fracture the bones from their attachment above, but this final freeing is usually an in-fracture from outside pressure as described in the following paragraph

The next step is to fracture the nasal bones above inward toward the septum, this is the small bridge of bone at the upper limit of the saw cut at the nasal process of the frontal bone The fracturing is done by firm pressure with the superimposed thumbs (Fig 81) If the arch of bone is particularly wide or firm, some preliminary loosening can be done by outward

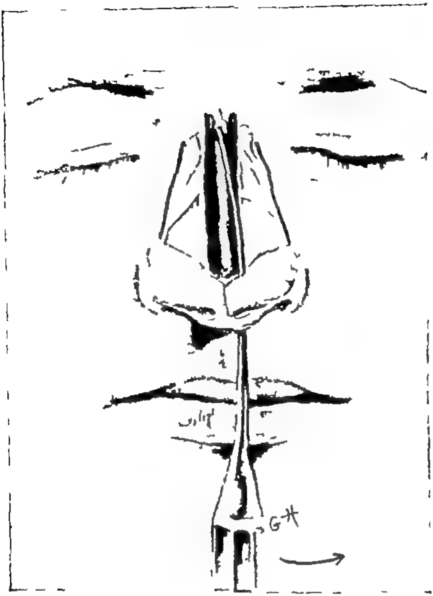


Figure 80 Use of an osteotome or chisel as a lever (with the fulcrum against the septum) to out fracture the nasal bones. This produces a good high fracture after which the bones can be pushed inward quite easily

Figure 81 Simple in-fracturing of nasal bones by pressure with both thumbs

Figure [illegible] Reduction of a bulky nose by narrowing and shortening The narrowing has included all three sections of the nose the bones, the upper lateral cartilages of the mid section and the tip

Figure 83 Clearing of expression and shortening of bulky nose. Result shown one year after operation.

levering with a chisel, using the septum as a fulcrum (Fig 80) Occasionally these processes are freed by a small chisel let in through the skin at the angle of the nose

As the nasal bones and frontal processes are moved inward, they carry the upper lateral cartilages medially with them, and the bones and cartilages are molded into proper position The work on the upper two thirds of the nose is now complete (Figs 82 and 83)

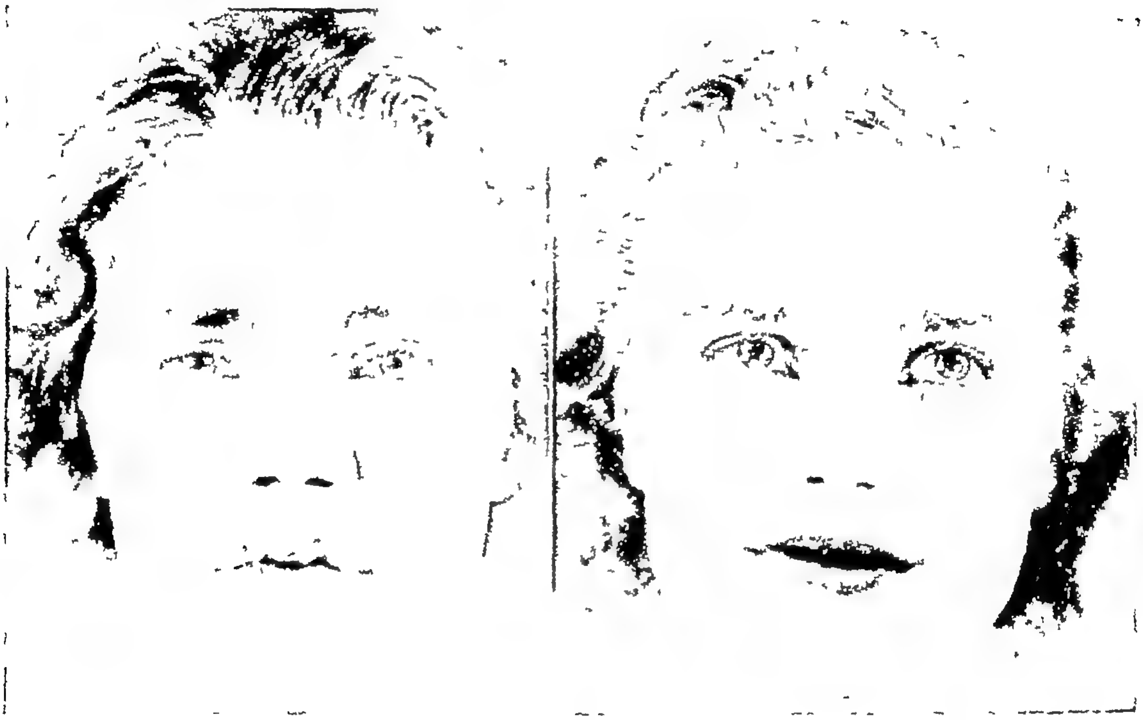


Figure 84 Narrowing of wide, low nose with some simultaneous elevation Result shown two years after operation

NARROWING THE NOSE AS A PRIMARY PROCEDURE

Noses with a good profile line, but which are excessively wide, can be improved by narrowing the nasal bones and frontal processes, thinning and moving the upper lateral cartilages medially, and reconstructing the tip as outlined in Chapters VII and VIII (Figs 84, 85, and 86)

To provide room for inward movement of the bones and upper laterals, it is necessary to excise a strip of bone and cartilage just lateral to the septum from the angle to the tip This can be done by scissors and chisels, but it is best done by a straight, thick, nasal saw (Fig 87) These saws are made in 2 and 2 mm widths

The usual initial incisions are made, and the skin over the entire nose is undermined The upper lateral cartilages are then cut loose from the septum (Fig 53) with scissors, care being taken to cut flush with the septum Any soft tissue is dissected off the outer surface of the upper laterals

(Fig 71) and discarded A strip of cartilage is then trimmed off the medial border of each upper lateral (Fig 72) removing a little more width inferiorly than superiorly so that the excised strip is a little like a wedge. The proper width straight nasal saw is then used to cut out a trench of nasal bone on either side of the septum (Fig 88) Again it is essential to get the tip of the saw through first. The reduction in width is the area sawed out by the saw blade plus the inward position

Any resulting bony irregularities are smoothed off with a rasp More sawdust than usual is created by this operation so that good final cleaning with a puller rasp and suction is essential The frontal processes are sawed through on either side and the bone in fractured in the usual manner carrying the upper laterals medial with them Any indicated tip reconstruction is then done.

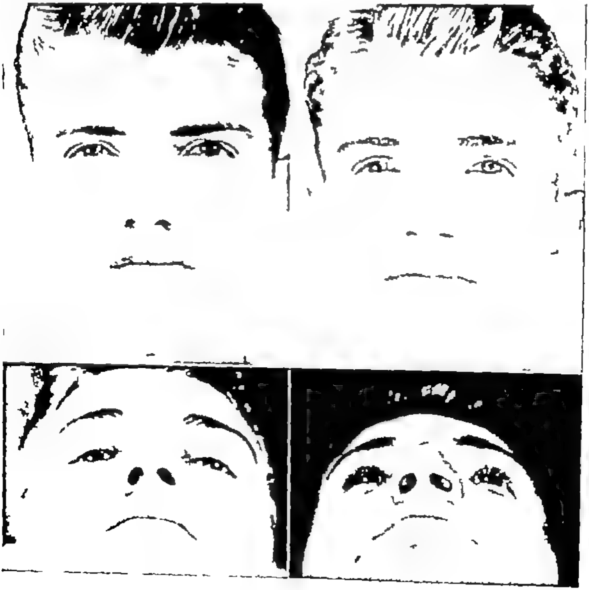


Figure 89 Thinning and straightening of old fractured nose including tip.

Figure 86 Narrowing wide nose to get thin dorsum from angle to tip

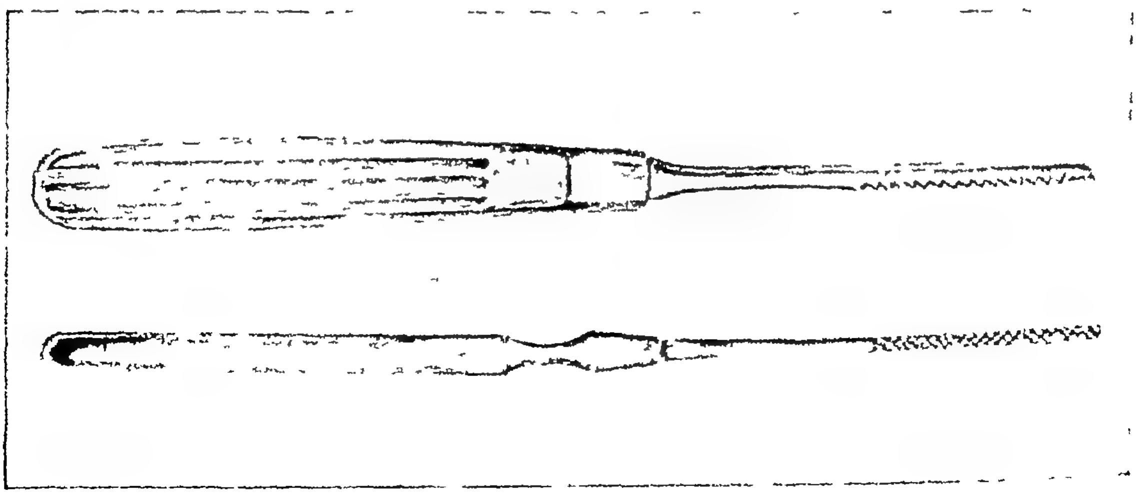


Figure 87 Straight dorsal saw, made in two widths

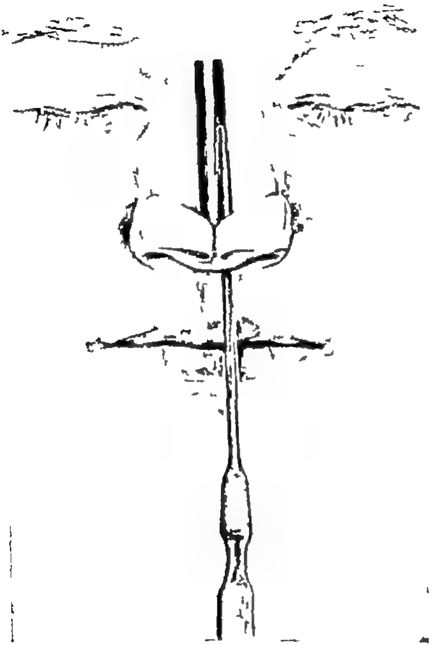


Figure 88 Removal of a trench of bone on either side of the dorsum with the straight dorsal saw The corresponding area through the upper laterals is removed with scissors, and should be somewhat triangular wider near the tip

The nasal bones in these patients are apt to be thicker and heavier than in humped or large noses, so that a little more difficulty may be encountered in moving the bones inward and keeping them there If this proves troublesome, the use of through-and-through wires (as outlined in Chapter XI and XIV) may be helpful

Results noted are a general refinement of expression and improvement of the nose in the front view (Figs 84, 85, and 86), and establishment of the nose as an entity itself, rather than a lost feature in the plane of the face

CORRECTION OF THE "HATCHET" NOSE

Excessively thin, sharp nasal humps may lend an undesirable, sharp expression to the entire face This is particularly true when the nasal tip is *also elongated, the whole effect sometimes being that of a somewhat satanic* facial expression in an individual who may be perfectly happy and wholesome The expression can be cleared in these individuals by excision of the hump and shortening of the tip If the hump is small, it may be possible just to smooth off the edges with a rasp after minimal saw excision, and omit narrowing the nose (Fig 89) If the hump is larger, the nose will usually appear excessively broad after it is removed, and such noses require the usual narrowing procedure (Figs 90 and 91).

Figure 89 Reduction of thin nose to produce more rounded, pleasing expression Removal of hump without narrowing the bones

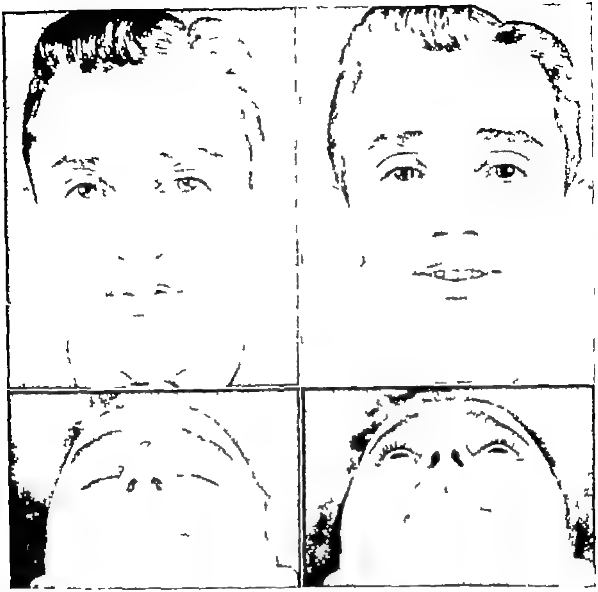


Figure 90 Appearance of shorter more rounded face produced by complete osteoplastic operation which included removal of thin hump and shortening of nose

OTHER CONSIDERATIONS IN NARROWING PROCEDURES

In some wide low noses it is possible to elevate the profile line by narrowing the nose while excising nothing from the dorsum thus converting width into height This subject is so important that it is considered separately in Chapter XI

If a nose is both very wide and very low correction will require a preliminary osteoplastic narrowing and building up (Chapter XI) followed at a later date by a cartilage or bone transplant (Chapter XII)

Tip reconstruction is nearly always essential in any wide nose If one narrows the upper two thirds of such a nose and leaves a wide bulky tip the total effect may be even more undesirable than before operation

Figure 91 Elimination of sharp expression by removal of thin hump and shortening of nose

In-fracturing the bones narrows the upper third of the nose, but excessive width in the midsection of the nose is corrected only by excision of subcutaneous tissue over, and trimming of, the upper lateral cartilages In extreme instances, it may also be necessary to excise skin, either at the nostril bases (as in the Wen operation described in Chapter IX), or as a vertical ellipse down the middle of the dorsum (Chapter XV) Trimming and replacement of bone and cartilage will never correct deformities which are due to soft tissue

Various attempts have been made to fracture the bones in by pressure without sawing, or to twist them loose and in by various bone-holding forceps, but these procedures are likely to result in no fracture, an incomplete fracture, or an irregular fracture at an undesirable level Chisels have often been used for this purpose, but are more difficult to control and may result in undesirable cracks or splits The saw can be controlled as to the level and extent of the cut, and produces a smooth cut so that it seems definitely preferable, even though it is more time consuming and difficult for the operator than the chisel

Chapter VI

SHORTENING THE NOSE

IN MAKING ANY DECISION about shortening a nose several factors must be considered (1) the relative length of the nose (from angle to tip as compared to the length of the upper and lower thirds of the face) (2) the septolabial angle (3) the columellar labial angle (4) the curvature of the nostril rim (5) any septolabial webbing due to a prominent nasal spine

Most artists consider the ideal face to consist of balanced thirds the upper third extending from the hairline to the nasal angle the middle third from the nasal angle to tip the lower third from the nasal spine to the tip of the chin Usually an attempt is made to bring the length of the nose into the best possible balance with the other thirds However if the patient has a normal-sized forehead and a huge jutting chin the nose is balanced in length with the forehead and one considers cutting down the chin at a later operation (Fig 331) Conversely if the patient has a normal chin and an excessively high forehead the nose is balanced with the chin and the advisability of disguising the height of the forehead by hair styling is considered with the patient. When both the upper and lower thirds are not far from normal length but differ the length of the nose may be a compromise with due regard to length of the upper lip The assistance of an artist in determining these proportions on each patient has been invaluable and full face casts are beneficial to operator and patient.

The length of the nose is determined by the length of the septum and the nose is shortened by excising a strip from the lower end of the septum If this strip is rectangular the entire columella will be elevated this will shorten the entire nose and lengthen the upper lip apparently without changing the columellar lip angle much. If a wedge is excised from the lower end of the septum (with the base anteriorly and the point at the nasal spine) the tip will be tilted upward thus opening the columellar labial angle The importance of careful preliminary study of the patient and his plaster cast to determine the size and shape of this septal excision is obvious (Figs 92 and 93)

The ideal" nasal profile has three lines one for the dorsum one for the columella and its junction with the lip and a third diagonal line slanting upward from the columella to the dorsal line (the tip line) This columellar tip break or third plane is present in most attractive noses and it is worth while to try to reproduce it at operation (Fig 106) It can sometimes be produced by wedge trimming of the lower rim of the vertical cruces of both alar cartilages or by trimming the lower end of the septum so that there is

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Chapter VI

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a distinct break at this point (Fig 106) This desirable quality may be present even in a deformed nose, and it is easier to obtain if there is a tendency to it This type of nose is more natural looking and more attractive than a routine single angle nose with columella meeting the dorsal line at about a right angle

Figure 92 Change of expression resulting chiefly from shortening nose from columellar labial angle of 82° to 95° This illustrates the marked advantage of changing the profile in some patients, and avoiding the tendency to increasing deformity Photographs at interval of six months

Before making any final decision about trimming the lower end of the septum, one should examine the dimension of the columella (from septum to skin) throughout its full extent An excessively prominent columella is due to large medial or (vertical) cruces on the lower lateral cartilages, if more prominent in the middle, or at the tip so that it hangs down in a bow, it is known as a hanging columella The correction of a hanging columella requires an intrinsic operation which is described in Chapter IX If the patient has an excessively large columella, or a hanging columella, it is best to trim the columella first, and then re-estimate and trim the lower end of the septum

In most normal noses, several millimeters of columella can be seen in the profile view, usually more in women than in men When less than the normal amount of columella is visible, the condition is "hidden columella"

This may be due to a short septum or hanging alae and any shortening the septum tends to aggravate this deformity Therefore in such noses is best to trim the lower border of the horizontal cruces of the alar cartilag first this elevates the alar rims into natural curves exposing the columel The simple procedure of shortening a long nose may convert a long fa into a more pleasant round face (Fig 94)

Figure 95 Correction of long hooked nose which caused disappearance of lip on smili Change from 75 to 90 . Excised dorsal hump and hooked lower end of septum in inse

TECHNIQUE OF SHORTENING THE SEPTUM

The septum is important in the support of the nose and serves the sar purpose as an armature in sculpture though to a greater degree. Its fir shape should correspond to the three line drawing of the ideal nose for t patient at hand remembering that the dorsal skin will be superimpos over the dorsal line the tip cartilages over the tip line and the columel over the columellar line

Figure 94 Change of appearance of oval face to round face from shortening nose and changing hair style Unposed clearing of expression (Conumellar-labial angle opened from 90° to 115°

At operation, the columella is displaced laterally so that the septum projects out of one nostril The dome of the nostril is then retracted forward and upward with an S-ribbon retractor, and the lip is held down with a double-hook straddling the base of the septum to get better exposure Connective tissue over the edge of the septal cartilage is divided until bare cartilage is exposed The predetermined segment of septum may then be excised (Fig 95) with a knife, and any excess mucosa trimmed flush with the cartilage The amount of excision of the septum should be determined carefully and the operation done conservatively because it is surprising how little is needed in removal to effect the desired change Too much excision lets the columella come up toward the hidden position, this is as bad as the prominent columella It may be restated that a normal graceful amount of columella with the skin that goes up into the nostril over it gives a pleasing appearance to the profile

The retractors are removed, the columella carefully replaced against the septum, and the profile view studied to see if the final correction has been obtained Any excess of over-tilting will leave the nose so that the nostril interiors are too exposed on the front view, an undesirable design for most patients

The older works on art and nasal surgery usually stated that the colum-

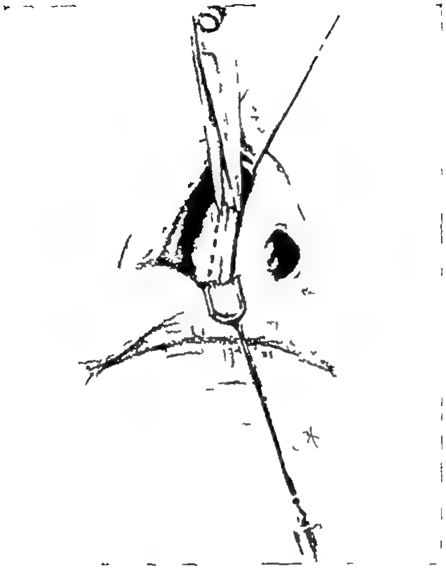


Figure 93 Excision of strip from lower end of septum to shorten nose without changing angle with lip To open lip angle the excised portion should be a wedge A refinement in technique is to excise the cartilage and mucosal surfaces separately

Figure 96 Cutdown of deformity thought to be racial, with increase in length of lip which formerly disappeared on smiling Angle opened up from 92° to 115°

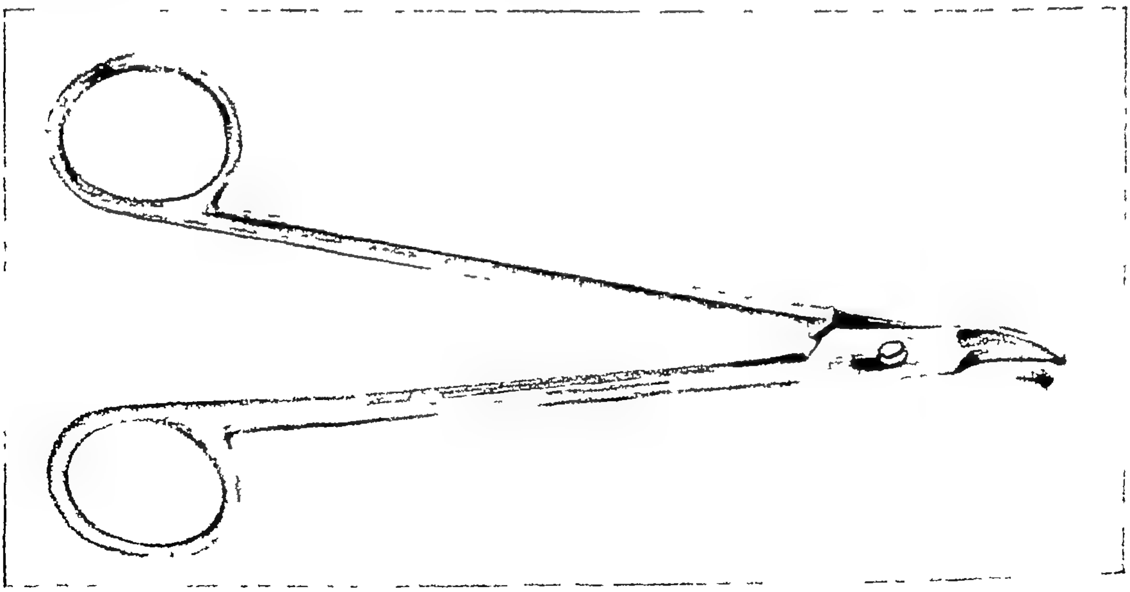
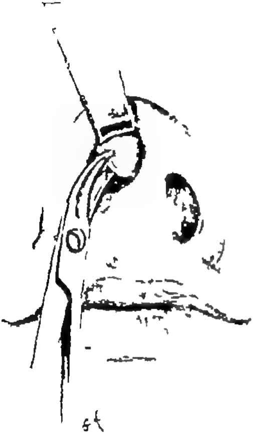


Figure 97 Right-angled nasal scissors used for trimming end off upper laterals



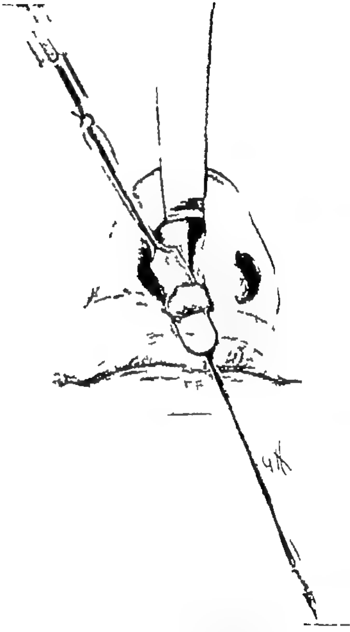


Figure 98 The upper laterals should be shortened at least as much as the septum

Figure 99 Chiseling out of excessive portion of nasal spine which produces webbing between septum and lip

Chapter VII

RECONSTRUCTION OF THE LOWER LATERAL CARTILAGES BY RIM INCISION EXPOSURE*

AFTER REDUCING THE upper two thirds of the nose and shortening it, any enlargement of the tip becomes even more noticeable At this stage, it is usually necessary to cut down the height, width, length, and general bulk of the lower lateral cartilages (Fig 101) In patients in whom the enlarged tip is the main deformity, it may be best to do the tip reduction and fine adjustments before undertaking the more gross work of narrowing the bones

The evolution of these operations for reconstruction of the nasal tip is one of the most important developments in modern rhinoplastic surgery The essential features of reduction of the bony nose were all laid down by Joseph, but he apparently did not pay much attention to the varying anatomy of the alar cartilages, or to the correction of them (Figs 102 and 103) This is rather surprising as the main deformity is often in the tip in contemporary patients, as were the legendary deformities in Cyrano and Pinocchio

The alar (or lower lateral) cartilage consists of two limbs or cruces, the vertical or medial crus in the columella which is responsible for the height of the tip, and the lateral crus in the ala which determines the width and prominence of the tip The point at which these two cruces join is known as the dome

Exposure of the alar cartilage may be obtained by a rim incision, undermining and swinging it down like a bucket handle into direct view as described in this chapter, it may also be exposed by undermining downward from above, cutting through the dome, and everting the horizontal crus and vertical crus separately, as described in Chapter VIII The eversion technique is the most recent and is preferable in most noses for an experienced operator, because it does not leave any rim scar However, it does present the alar cartilage in two segments and in an inverted position, so that the rim incision method may be preferable for an inexperienced surgeon dealing with any nose deformity, and for the experienced surgeon dealing with a very extensive tip deformity

The main tip deformities are excessive height in an anterior-posterior direction (Fig 104), excessive width (Fig 105), excessive bulk from above downward (Fig 106), or some combination of these The height and width are best judged by viewing the nose from the bottom In this position, the nose should have the shape of a triangle, rather than a square or rectangle (Figs 105 and 107)

*The "eversion technique," as in the next chapter, supplants the "rim incision" almost entirely

Figure 101 Huge tip cutdown, consisting of excision of height, width and length from both alar cartilages. Change so extreme that it approaches the necessity of excising some skin.

The importance of this triangular shape at the bottom has often been missed in the past but it is absolutely essential to a good nasal reconstruction It is realized that the ordinary observer never sees a nose in this position but a tip which appears triangular in this view and which corresponds to the rest of the nose in size will almost always appear perfect on front and profile views

OPERATIVE TECHNIQUE

A semicircular incision is made just inside the nostril rim with a No 15 blade extending from a few millimeters anterior to the nostril base to the dome and then down about halfway on the columella (Fig 108)

A small blunt pointed iris scissors is inserted in the rim incision and the skin over the entire tip is thinly undermined by spreading and dissection (Fig 109) in areas that may have been missed by the primary separation when the dorsal skin was raised after the first incision The undermining is

also carried between the vertical cruces of the two alar cartilages in the columella

An S-ribbon retractor is inserted under the skin in the region of the dome, and the cartilage is pulled down into view with a hook (Fig. 110) In doing this, the cartilage is swung on pedicles at its two extremities like a bucket handle After it is pulled down into view, the closed end of a Mayo dissecting scissors is inserted through under it, and held as a retractor by an assistant (Fig 111)

On first exposure, the surface of the cartilage will be concealed by an overlying layer of fat and connective tissue of varying depth This soft tissue is dissected off in a single layer by the use of a small sharp-pointed iris scissors In some tips, the main excess in bulk will be in this soft tissue rather than in the cartilages proper

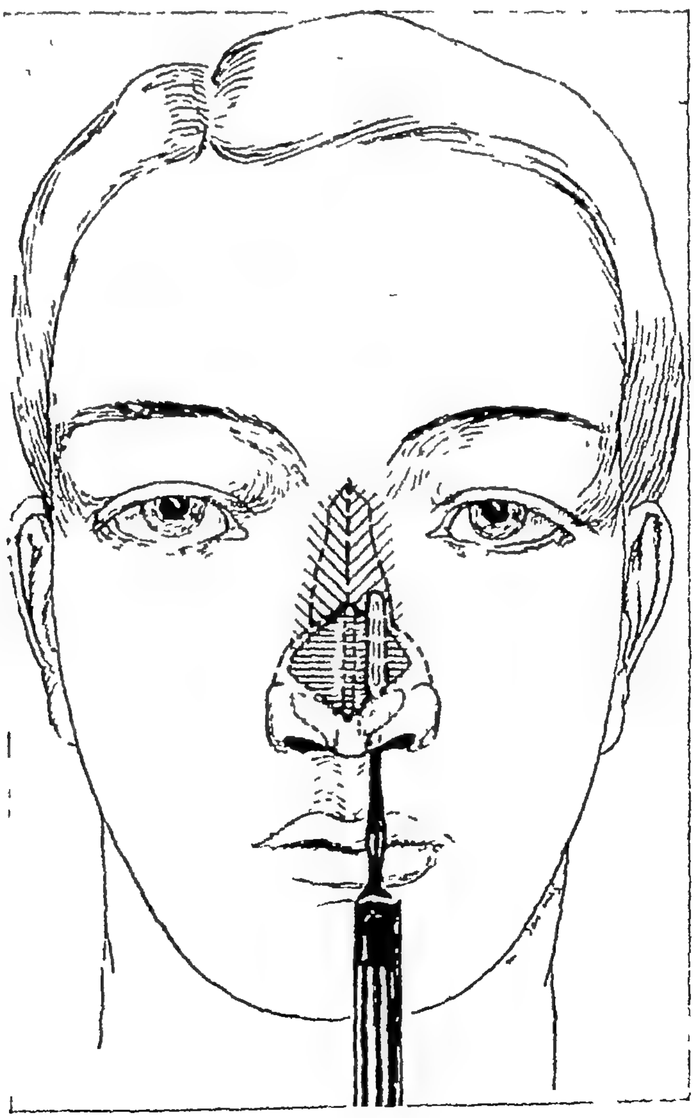


Figure 102 Illustration from Joseph's book published in 1931, showing idea of anatomy of alar cartilages at that time

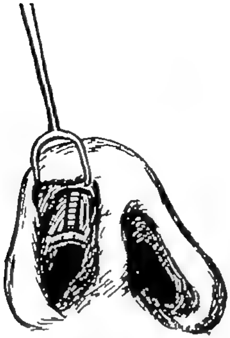


Figure 103 Another illustration from Joseph's book showing the operation then practiced on alar cartilages. The recent development of total reconstruction of the alar cartilages is one of the most important advances in nasal surgery

Figure 104 Correction of nose in which main deformity is excessive height of tip cartilages.

Figure 105 Conversion of a square boxlike tip into a normal triangle The whole effort of tip reconstruction is to get a good triangle, as such tips are always pleasing on front and profile views

Figure 106 The main deformity in this nose is the thick, heavy, rather masculine tip (including a hanging columella) Excision of height, width, and length from alar cartilages and shortening of columella result in an attractive feminine nose The "break" between the columella and tip lines is also important

Figure 107 Conversion of a wide square tip into a more feminine triangle to improve front and profile appearances of nose

Figure 108 The rim incision for exposure of the alar cartilages extends from near the nostril base forward, over and down about halfway on the columella.

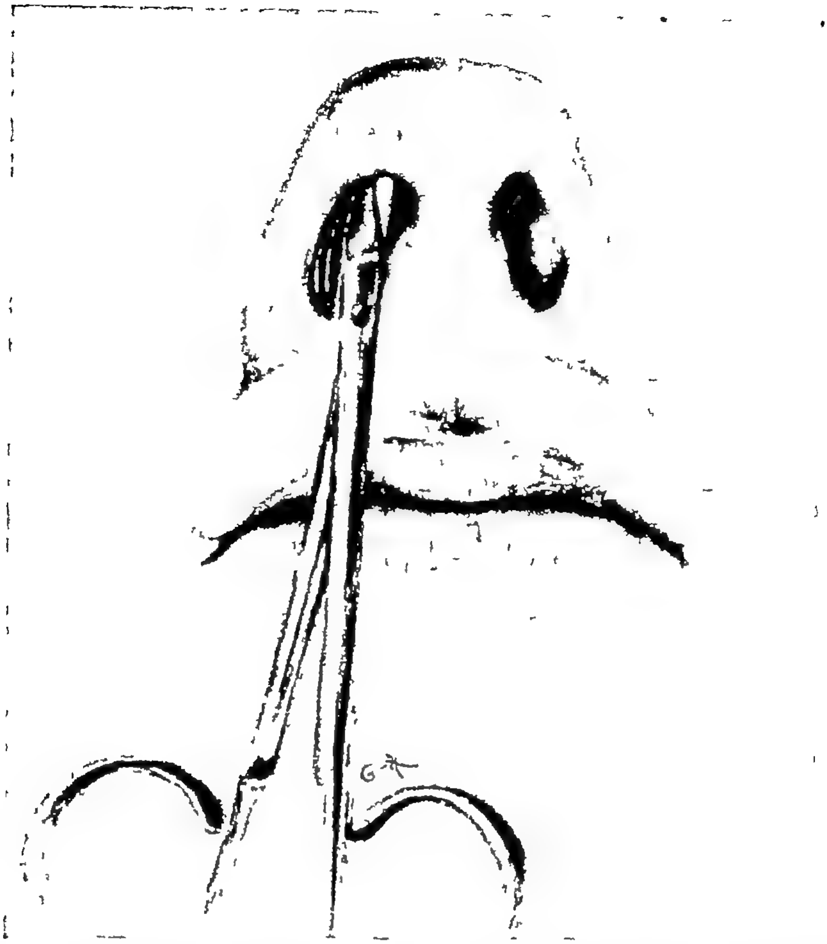


Figure 109 Undermining the skin over the tip cartilages for mobilization

The cleft tip is often due to an accumulation of soft tissue between the domes of the two alar cartilages Correction consists of removal of this soft tissue, plus some reduction in the width of each cartilaginous dome (Fig 122)

After the cartilage is cleaned, it is allowed to drop back in place and the dome is located The dome is at the highest point of the tip and it is the angular junction between the medial and lateral cruces The exact point of the dome is grasped with a hook or thumb forceps, and the cartilage is then pulled down into view again and the usual retractors are inserted

Removal of a strip across the alar cartilage medial to the dome will cut down the medial crus and thus reduce the height of the tip a corresponding amount Removal of a strip across the alar cartilage lateral to the dome will cut down the lateral crus and thus reduce the width of the tip a corresponding amount It is frequently necessary to cut down the tip some in height and in width, so that in such instances the excised strip will straddle the dome (Fig 112)

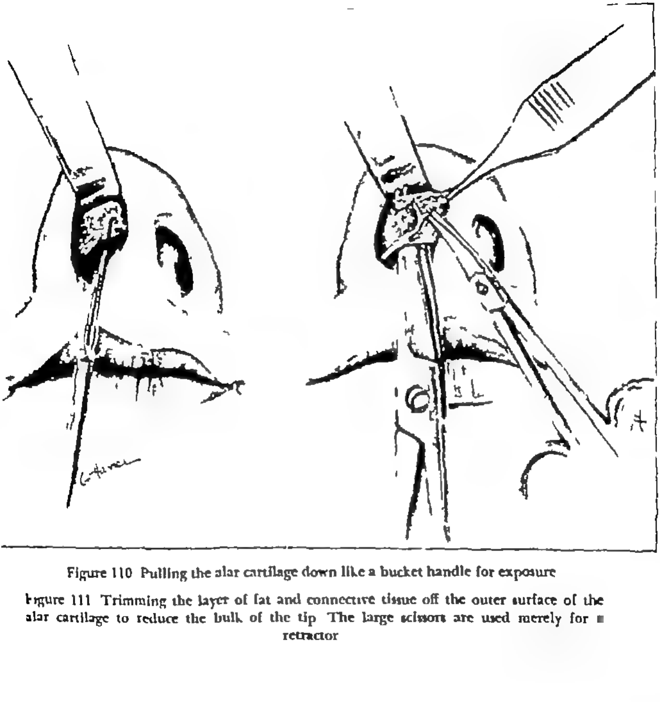


Figure 110 Pulling the alar cartilage down like a bucket handle for exposure

Figure 111 Trimming the layer of fat and connective tissue off the outer surface of the alar cartilage to reduce the bulk of the tip The large scissors are used merely for a retractor

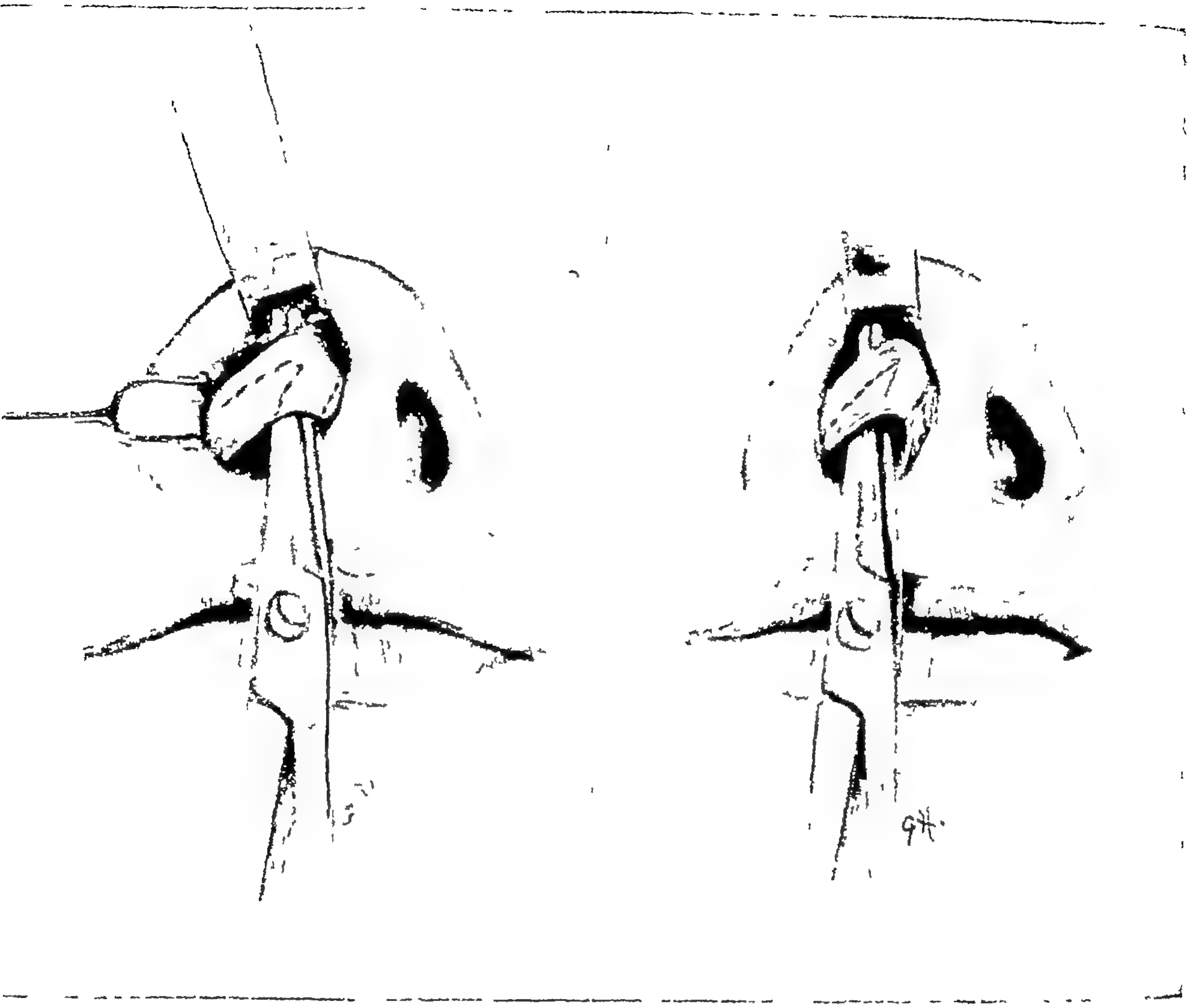


Figure 112 Dotted line indicates the single hockey stick piece that can be excised to remove height, width, and length from the alar cartilage The cross section of the excised piece straddles the dome, so that it includes part of the medial crus and part of the lateral crus

Figure 113 Lateral and medial cruces after excision of the hockey stick piece Dotted line on lateral crus indicates excision to elevate nostril border for more exposure of columella in profile Dotted line on medial crus indicates excision to tilt the tip up more than the columella and produce a "break"

Excision of a longitudinal strip across the whole upper edge of the lateral crus will reduce the length of the tip from above downward and is desirable in most enlarged tips. This can be combined with the excision of the cross strip so that the total excision consists of the removal of a single piece which is shaped roughly like a hockey stick (Fig 112)

Excision of a strip along the lower border of the lateral crus will elevate the nostril border and expose more columella on the profile view This strip is usually wedge shaped as shown in Fig 113 and removal of it is often the best corrective procedure for a hidden columella unless additional cartilage support within the septum or columella is necessary to bring the latter down into view

Excision of a wedge along the lower border of the medial crus will tilt the tip up and often create the desirable break between the profile lines of the columella and tip (Figs 106 and 113) This should not be too extreme as it will flatten the tip too much

The portion of the hockey stick segment should be wide enough on either side of the dome to remove the desired amount of width and height, but must not be too wide to prevent the remaining lateral and medial crus from coming together to form an intact cartilaginous arch again It may also be necessary to trim the ends of these remaining cruces a little so that they will fit together properly

It is usually best not to excise any lining in this area The whole operation depends upon redistribution and elasticity of skin anyway and this inside skin will usually conform as the covering skin does. Any lack of lining in the finished nose will leave an area in which the undersurface of the skin is raw this will heal by scarring and may lead to indentation of this point. Differences of opinion on this exist from some surgeons not even cutting entirely through the cartilage arch for fear of collapse of the tip to others who excise cartilage and attached lining in equal amounts The method described here is in a safe margin according to results obtained

The careful reconstruction of the alar cartilages is one of the most difficult and tedious portions of the entire operation but is essential to obtain the best results

Chapter VIII

RECONSTRUCTION OF THE LOWER LATERAL CARTILAGES BY THE EVERSION TECHNIQUE WITHOUT RIM SCARS

By complete undermining of the skin over the lower lateral cartilage from above, and cutting through the dome, it is possible to evert the horizontal and vertical cruces separately and trim them without any resulting rim scars This procedure is a little more difficult to learn than the rim incision technique, but leaves a nicer nostril rim (Fig 114) and is definitely worth the extra effort The cartilage is swung out of the nostril on a hinge of skin along the nostril rim

The purpose again is to convert a square boxlike tip into a nice triangle with resulting refinement of the tip in the front and profile views (Figs 115 and 116) In many noses this tip work produces more improvement even than the work on the bones, the operator who omits it, or just punches a small segment out of the dome, may be omitting the most important part of the operation and securing far from perfect results

If the skin over the alar cartilages has not been undermined earlier in the operation, it is done at this time Curved Mayo dissecting scissors, or blunt-pointed iris scissors, are introduced through the opposite nostril and the tips inserted between the skin and the upper border of the alar cartilage (Fig 117) The nostril is partially everted with an S-ribbon retractor and the fingers, and the skin is undermined completely down to the nostril rim all around by spreading and dissecting with the scissors

After the undermining is well started, it can be completed by dissecting with a right-angled scissors through the nostril opening on the same side (Fig 118) In any event, the undermining must be carried completely down to both nostril rims all around, and also between the vertical cruces of the two cartilages within the columella

The dome is then accurately located, and mucosa and cartilage are cut across with dissecting scissors at this point, thus separating the lateral crus from the medial crus (Fig 119) The lateral crus is then everted with a hook, and the layer of fat and connective tissue on its skin surface dissected off until it is left quite clean and exposed

A hockey stick piece of the cartilage may then be excised (as shown by the dotted lines in Fig 120) to reduce the width and length The trimming again is only of the cartilage, and little or no lining is removed After this, the lateral crus is replaced, and the tip is examined again, if the height and columellar angulation are correct, nothing further need be done

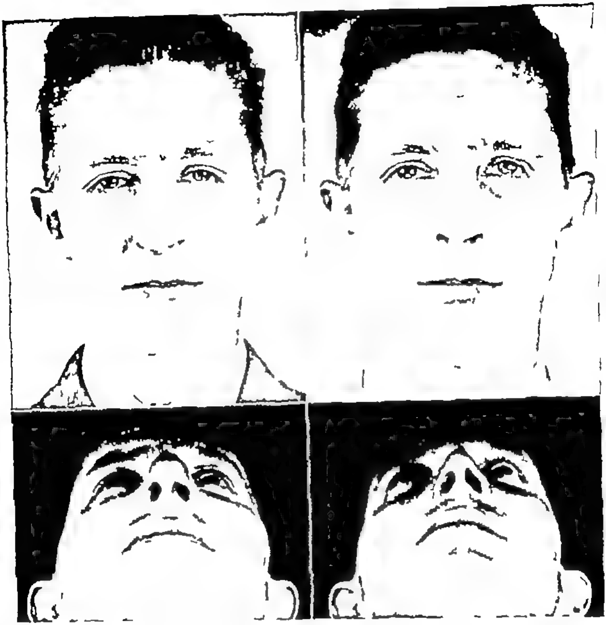


Figure 114 Result of resecting height, width and length from the alar cartilages in a bulky drooping tip

If height is to be removed the medial crus is everted (Fig 121) cleaned and the desired segment excised from the top If the tip line needs to be tilted more to produce a columellar break a wedge is excised from the inferior margin of the cartilage (away from the hook) near the tip

The medial crus is then replaced and the same procedures repeated on the opposite side if the two alar cartilages are symmetrical Often they are not symmetrical so that the excision will have to be different on the two sides. The objective is to get the remaining segments of cartilage the same on the two sides and to leave medial and lateral cruces that will fit together

easily to form intact cartilaginous arches, wide and large enough to support the nostril walls in a normal position

This last point is emphasized because of the recurrent misunderstandings regarding the causes of postsurgical collapse of the tip and postsurgical pinching-in or denting of the nostrils These deformities can be prevented once their difference and their etiology is understood

Postsurgical collapse of the tip results from too much resection of the alar cartilages with loss of support The nostril becomes too small and flabby, may collapse completely on inspiration, but can be easily spread open with a speculum Prevention consists of leaving enough of the lateral and medial crures so that they will easily come together to form an intact arch of normal size and strength

Figure 115 Unposed complete change of expression The key point is shaping the tip so that it will appear as a balanced triangle from below

It has been stated that the entire alar cartilage can be removed safely but this has been based upon seeing nostrils of fairly normal size in which the alar cartilages have been destroyed by infection and the nostril walls stiffened by fibrosis As a safer policy in nasal tip reconstruction it is suggested here that enough cartilage always be left to form a supporting arch

At the other extreme is the occasionally expressed view that the dome should never be resected This statement also needs qualification When it is desired only to remove a little width or a little height the original cross-cut can be made one or two millimeters to the corresponding side of the dome the desired crus everted and a strip removed across its end leaving the dome attached to the end of the other crus This maneuver will leave a slightly more rounded dome with less possibility of a sharper new dome

Figure 116. Unequal trimming on the two sides to leave symmetrical segments of the alar cartilages. Tip balanced in contour to the rest of the nose

Figure 117 Undermining the alar cartilage from the overlying skin, by use of scissors inserted through the opposite nostril

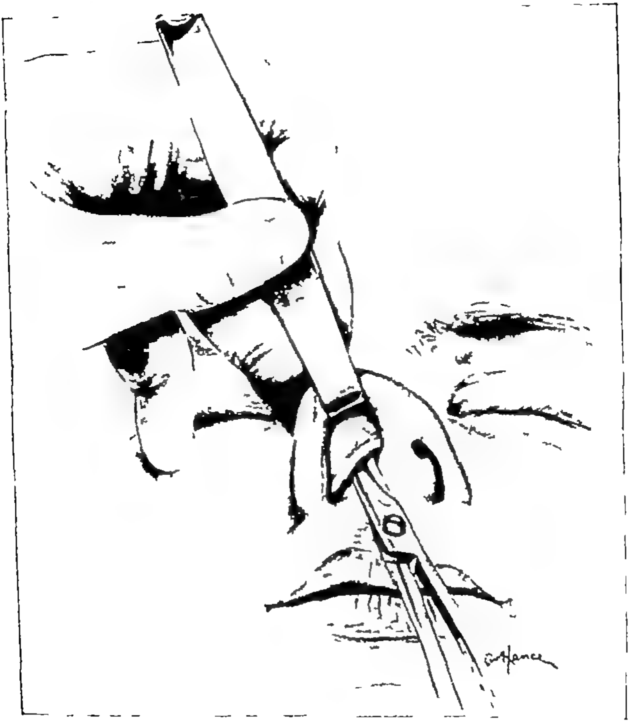


Figure 118 Completion of the undermining by use of right-angled scissors through the same nostril.

Figure 119. Cutting across the alar cartilage to divide the horizontal crus from the vertic
crus

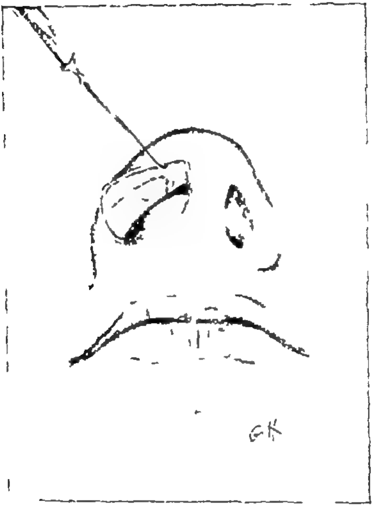


Figure 120 Eversion of lateral crus with a hook. Dotted line indicates hockey-stick excision to reduce the tip in width and length.

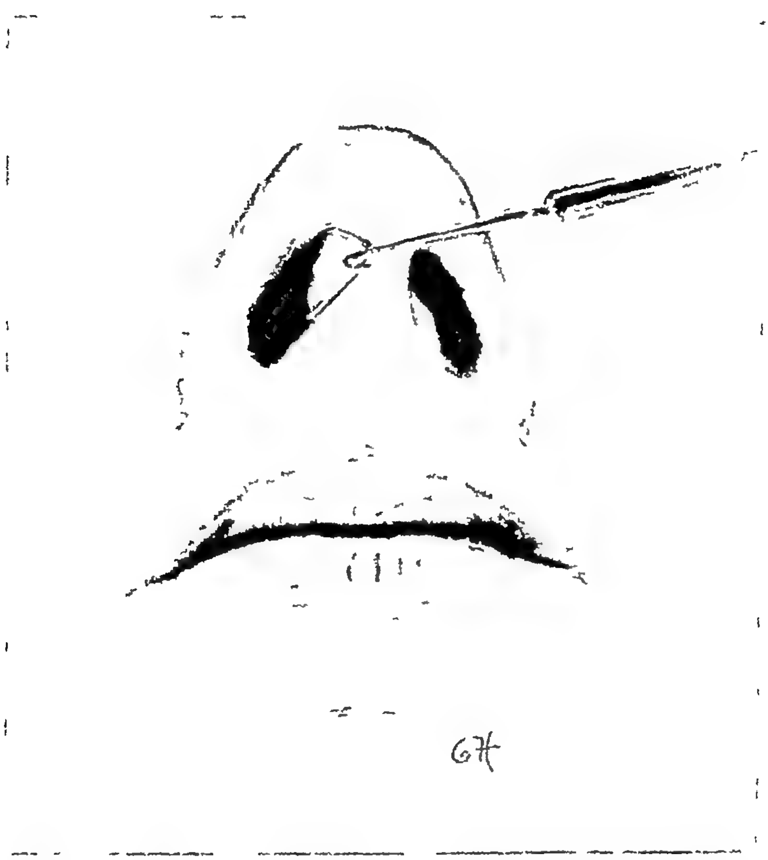


Figure 121 Eversion of medial crus Height may be cut off across the top Excision of a wedge from the lower edge (other side from the hook) is occasionally helpful in tilting the tip up

showing through the tip skin as an angle However tips which have thin skin and which require so little resection sometimes may be better left alone entirely

In very large tips requiring considerable removal of both height and width it may be better to include the dome in the resected segment than to leave it in as a tiny unstable central fragment and thus create a three piece arch The new dome will be formed by the junction of the trimmed medial and lateral cruces the two-piece arch will be more stable and any

Figure 122. Cleft tip" due primarily to soft tissue between the medial cruces in tip Correction consists of removal of wad of soft tissue plus trimming of width out of lateral cruces.

increased angularity of the new dome will usually not be visible through the thicker skin of these large tips In tip reconstruction, it is better to concentrate on what should be left, rather than what should be resected If these normal anatomical requirements are understood and met in each instance, tip collapse will not occur, and catch phrases may be dismissed

Postsurgical pinching-in or denting of the tip* is the result of removing too much lining Due to internal scarring, the nostril is small, pinched in,

Figure 123 Large nasal droop, corrected by shortening septum, and by resecting height width and length from alar cartilages Removal of wedge from lower edge of medial crures is helpful in this type to tilt the tip up a little

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*See Chapter XXII for further considerations of collapsed tips and pinched in nostrils

tions are removed, as though it were permanently molded in this shape. This "skin mold" can be overcome, however, and the skin made to conform to the new shape of the alar cartilages by the usual period of pressure dressings with an external aluminum splint. It is important at this stage not to cut down the cartilages if they are small enough already and the bulky appearance is due only to lack of skin conformation. To judge this, it is sometimes best for the surgeon to remove his gloves and palpate the tip lightly to feel the underlying cartilages through the skin. He can then lightly press the skin in against the cartilages without displacing them, and see if the tip will be of the desired size and shape after the skin has conformed to the new cartilaginous framework. During this procedure he can also feel any little remaining sharp projections of cartilage that might need trimming.

Figure 127. Another example of nose in which tip reduction is the most important part of the operation.

The correction of a cleft tip (Fig 122) is approximately the same by this method as when the rim incision is used. The vertical cruces are everted and care is taken to remove the great bulk of fat and connective tissue between them particularly between the domes. The excess width in the lateral cruces near the domes is excised and the medial cruces are carefully placed as close together as possible especially at their anterior ends

The large droopy tip is corrected partly by shortening the septum partly by *excising width height, and length from the alar cartilage* and partly by wedge excision along the skin side of the medial crus to tilt the tip up and produce a columellar break (Figs 106 and 123) If the tip slumps down over the nostril openings toward the upper lip the tip may be elevated and the columella appear longer by getting the tip up over decent septal support (Fig 124) However the operation of implanting the lower end of the septum between the medial cruces is not recommended because this thickens the columella and this position is seldom retained permanently It is a strained position with the same amount of nostril opening pulled up in a stretched situation It is best to see that the septum is cut down to the existing nostril length and then reposition the nostrils without stretching them

The square boxlike tip which is wide long and high is the common deformity and it is *corrected* by *excising* bulk *from the lower laterals* in all directions (Fig 125)

Chapter IX

MISCELLANEOUS ADJUSTMENTS

HANGING COLUMELLA

A MODERATE AMOUNT of columella is normally visible in profile, more in women than in men. When little or no columella is visible the condition is known as **hidden columella**; an excessive amount of visible columella is unsightly and is called **hanging columella** (Fig. 126).

Hanging columella is an inherent deformity due to excessive length of the medial cruces of the alar cartilages from above downward. Although this frequently accompanies a long nose, trimming of the bottom of the septum will just shorten the nose and leave the hanging columella deformity. Full correction is obtained by trimming the enlarged medial cruces of the alar cartilages, together with overlying skin on the sides of the columella.

If the condition is moderate without too much "bowing" or curvature of the columella, this excision can be done on the upper surface of the medial cruces, working through the original opening incision (Fig. 127), and also removing a corresponding amount of skin from either side.

When there is marked "bowing" of the columella, a full thickness half-moon excision entirely through the columella will be required (Fig. 128). If this is the only deformity, the excision can be done as originally outlined by Joseph (Fig. 129). However, when it accompanies other hypertrophies of the alar cartilages (as it usually does), it is done through the incisions of the eversion or rim incision reconstructions, also removing overlying skin. The trimming is done so that the remaining lower border of each medial crus is fairly straight rather than rounded. Frequently this correction is combined with reconstruction of the entire alar cartilage, removing width and length from the lateral crus, and height and length from the medial crus (Figs. 130, 131).) However, care is taken not to remove much from the lateral crus, as this tends to elevate the rim and possibly expose more columella.

If the columella is bowed markedly, it may impinge on the upper lip and correction may give considerable apparent additional length to the upper lip (Fig. 132).

Excessive exposure of the columella is due occasionally to retraction of the alar rim, rather than to hypertrophy of the columella (Fig. 133). The correction consists of leaving the columella alone, complete undermining of the skin over the lateral crus and reduction of the width of the tip to make more skin available for shifting, and securing a straight lower border to the lateral crus implanted well down within the rim. This can be done by free

Figure 126 Improvement resulting mainly from resection of hanging columella and tip reduction Changes in hair styling expression, and dress in these patients are due usually to the improvement in their morale. The photographs are unposed.

ing the lateral crus from the lining as well as the skin covering trimming the lower border straight, and swinging it downward on a lateral pedicle. At times it may require free transplantation of a strip from the opposite alar or from the upper lateral cartilage

Figure 127. Resection of hanging columella. The straight line initial opening incision through the membranous septum is the upper border; the curved dotted line represents the lower border of the resection. The resection extends completely across the columella including both vertical crures and skin on both sides.

Figure 128 Result of hanging columella resection as outlined in Figure 127

Figure 129 Method outlined by Joseph for correction of hanging columella However this leaves a visible skin scar and the method shown in Figure 127 is usually better

Figure 130 Hanging columella correction as a part of complete osteoplastic operation on nose

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Figure 131 Narrowing and elevation of dorsum as described in Chapter XI, reconstruction of tip cartilages as discussed in Chapter VIII, and resection of hanging columella as outlined in this chapter

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Figure 132 Marked hanging columella impinging on upper lip Apparent length of upper lip increased by correction of hanging columella and nasolabial webbing




Figure 133 Apparent hanging columella, but deformity actually due to retraction of alar rim Corrected as described in the text

HIDDEN COLUMELLA

This deformity is usually due to loss of the lower end of the septum, which allows the columella to disappear upward As such, it is usually associated with loss of dorsal support, congenital retrusion or retrusion secondary to old fractures, septal abscesses, or specific infections, and is corrected by inserting an L-shaped cartilage or bone transplant as outlined in Chapter XII

Slight deformities not associated with loss of septal support may be due to an overhanging rim, and may be helped by trimming off the lower border of the lateral crus to give more curve and elevation to the nostril rim (Fig 134)

WIDE COLUMELLA

This condition is due to a large amount of soft tissue between the alar cartilages within the columella, plus too much lateral curvature of the free

lower ends of the medial cruces (Fig 135) Correction consists of removal of this excess soft tissue and trimming of the medial cruces through the usual eversion or rim incisions and then fixing the columella by mattress sutures anchored above through the septum Complete permanent correction may not be obtained due to laying down of fibrous tissue but this procedure will afford the most improvement for certain noses

Figure 134 Hidden columella, without loss of septal support, due to alar droop Correction by elevating alar rim into a curve as described in text.

The deformity may be unilateral with one side of the columella bulging into one nostril making the nostrils asymmetrical (Figs 136 and 137) This is usually caused by a curl in the lower end of the septum pushing one vertical crus laterally or by a displacement of the nasal spine Correction consists of removing the cause plus any necessary trimming of the medial crus on the affected side (Fig 138) Often the remaining portions of both alar cartilages also will require reconstruction

Figure 135 Correction of wide columella as outlined in text When a nasal droop is eliminated, the columella and nostrils come into view for the first time and any asymmetry should be corrected

Figure 136. Wide columella with impingement on one nostril and correction

Figure 137 Wide tip wide columella, and distortion from crooked septum. Correction improves appearance of nose in all views.

Figure 138 Distortion of columella due principally to crooked septum. Improvement from straightening and trimming septum, and reconstruction of lower lateral cartilages.

Figure 139 Short columella made to appear longer by thinning the base and thinning the tip of the nose

SHORT COLUMELLA

The short or infantile type of columella tends to keep the tip of the nose snubbed down close to the face, and to give round rather than normal adult oval nostrils When associated with a nose that is long in the mid-section, a curved or hooked nose is produced These contour defects occur in some racial deformities and the patients often request hump removal If the columella is not too short, the correction may consist of cutting down the nose to the size of the columella This cutting down is done mostly along the dorsal surface, rather than shortening the nose too much If the height of the dorsum is not brought down to the available size of the columella, dorsal curvature will reappear in late healing and secondary correction will be required

When the short columella is associated with congenital septal and nasal spine deficiencies and failure of adequate forward growth of the entire nose,

the condition is known as congenital retrusion Its treatment is discussed in Chapter XII

In extreme shortness of the columella with or without associated double cleft lip the correction may consist of advancing a flap out of the upper lip into the columella as described in Chapter XVI

Mild shortness of the columella can sometimes be disguised by thinning the tip and thinning the base to increase its apparent length (Fig 139)

NOSTRIL BASE EXCISIONS

In huge tips excisions of large portions of the cartilaginous framework may still leave too much skin and soft tissue for satisfactory reduction In such instances the remedy may be a wedge excision of part of the nostril base on each side (Fig 140) This is best done as a secondary procedure but occasionally may be carried out at the first operation The tissue to be excised is marked out with a pen and 5 per cent methylene blue the posterior limb of the excision being placed in the crease between the nostril base and cheek

The tissue is excised in one piece with a No 11 stab blade and the edges are carefully reapproximated with fine silk sutures This excision need not be carried completely through to include lining unless there is an excess there also the main bulk comes from the thick nostril wall and outside skin (Fig 141)

A similar type of correction may be used for wide flaring nostril bases excising some out of the nostril floor as well as out of the base if there is actually too great a circumference on the inside of the nostril This takes the curved flare out of the lateral walls and also sets the bases in closer to the columella (Fig 142) The patient may complain that he thinks his nostrils look negroid and this operation will usually help him more than anything else

These excisions about the nostril base can consist of more on the inside than the outside or the reverse or more from the nostril wall than from the floor or the reverse so that many different geometrical patterns of excision can be imagined to fit different types of deformity The very large nostril floor may have a rectangle excised and the ala simply set in with the help of a crease incision but possibly not with any excision of ala proper The opposite is true of the large tip and the bulbous ala when a pyramid of the heavy alar tissue is excised with the base out and the lining not opened

If the curved incisions around the alar crease are of too much unequal length there may have to be a little triangular closure out on the face. This is even helpful in reducing the porcine appearance in the nostrils of double cleft lips.

Figure 140 Huge tips may necessitate skin excision as well as resection of the alar cartilages. This is done by excising a wedge out of each nostril base.

Figure 141 The operation of nostril base excision Center photograph shows patient at operation with work completed on one nostril and area to be excised outline in ink on the other nostril base Conversion of horizontal nostrils to vertical ones. No inside lining excision done

These alar excisions are of various designs and degrees, and are for various purposes They require individual sculptural detail and are necessarily difficult On the other hand, they may yield some of the most satisfying corrections if carried out in proper design The name of Weir is attached to the general idea of the procedure, but the many variations do not permit the adoption of a standard procedure

Differences in height of the nostril bases in the face (usually of traumatic origin) can sometimes be helped by a Z transposition of flaps, one flap being the nostril base itself (Fig 143)

Figure 142 Reduction of large cavernous nostrils by wedge excision operation

Figure 143 Z transposition for elevating traumatic displacement of nostril (From Joseph)

NOSTRIL FLOOR ADJUSTMENTS

Differences between the two nostril floors are mainly associated with cleft lip (described in Chapters XV and XVI) but may have other congenital origin or be due to trauma

An absent floor or one which is too narrow is usually built up by switching a small triangular flap from just outside the nostril base inside to the nostril floor (Fig 144) This flap is a curved triangle with the medial border in the crease between the nostril base and cheek and the pedicle is in the lip just inferior to the nostril base After elevation of the flap (which consists of skin and subcutaneous fat) the nostril base is detached from the face and moved outward into the defect and the flap is put into the floor All incisions are closed with interrupted very fine silk sutures and these are kept covered with fine mesh grease gauze

For a floor that is too wide the reverse of this operation can be done and it is usually not necessary to switch the additional flap for closure of the cheek defect as outlined by Joseph (Fig 145) These wide nostril floors usually can be narrowed by excising a vertical diamond or ellipse out of the floor undermining either side and closing the defect with fine silk sutures or as mentioned previously by removing a rectangle and sliding in the alar border that has been freed along the crease.

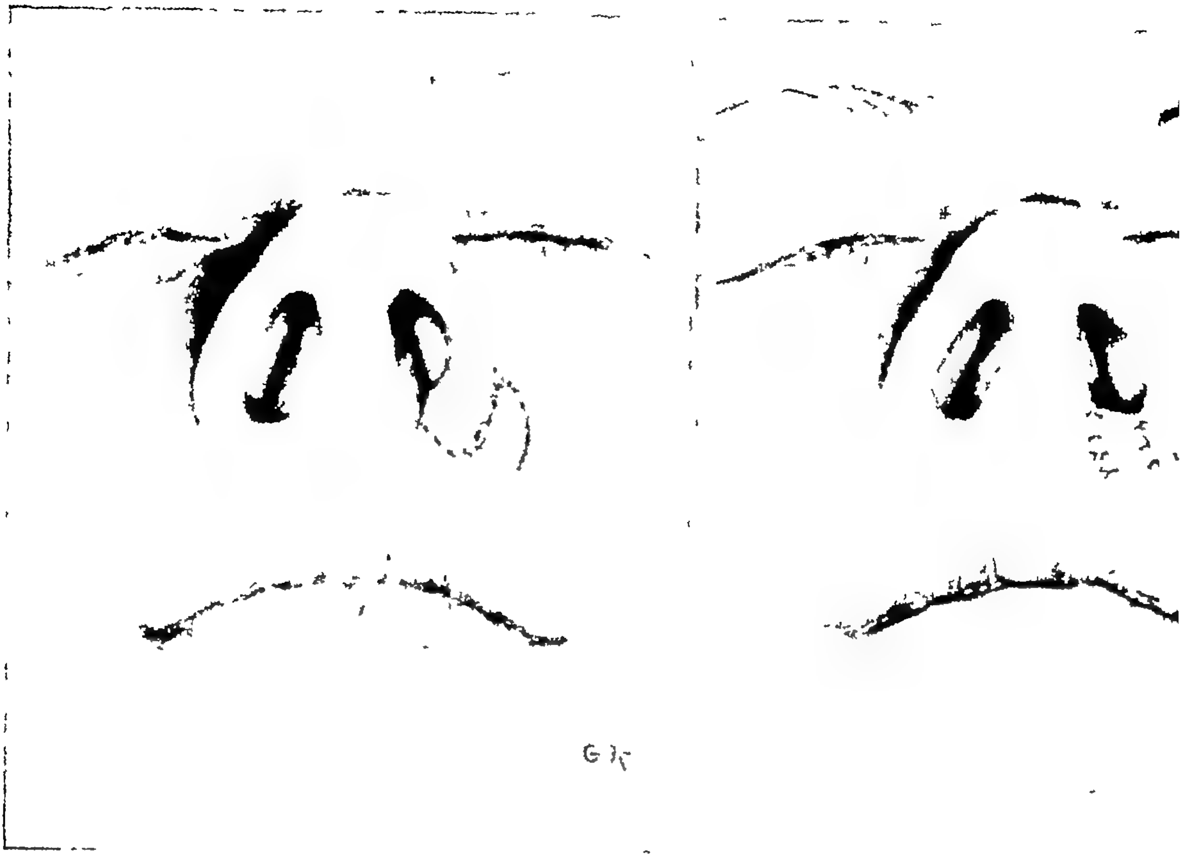

Figure 144 Reconstruction of missing or narrow nostril floor, by switching flap from outside the nostril base to the inside

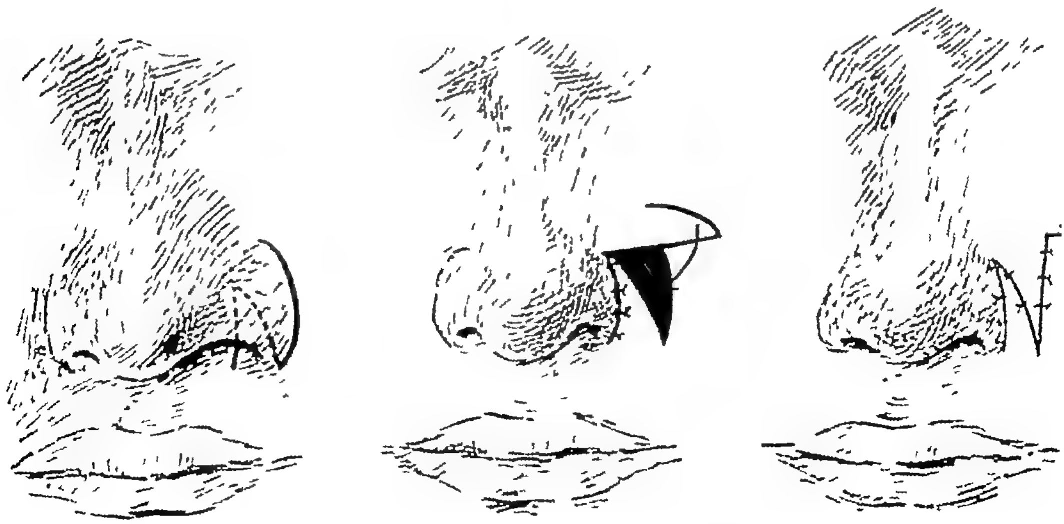

Figure 145 Reverse of Figure 144 as illustrated by Joseph The extra cheek flap is necessary Often, wide nostril floors can be reduced by simple diamond or oval excision as shown in Chapter XV

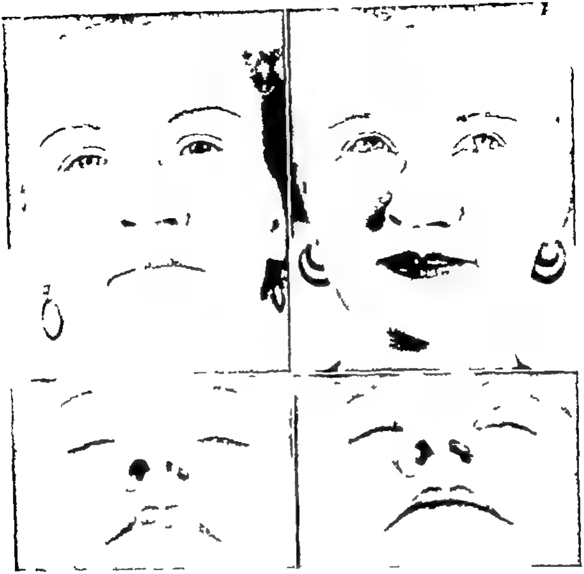

Figure 146. Pinched in nostril due to mucosal loss. Correction described in text.

PINCHED-IN NOSTRILS

Pinched in nostrils may be due to large losses of mucosa from specific or pyogenic infections and subsequent scarring inside. In such instances it is necessary to resect widely the scar and reline the area with a skin graft as described in Chapter XXI. It is noted here however that skin grafts high in the nostril are to be avoided whenever possible as the skin does not metaplase into mucosa and if it is grafted in a mucosal area it remains dry crusted and ill smelling because there is not enough fluid secreted to keep it moist as there is in the mouth where skin grafts are more satisfactory as lining.

The substitution of mucosal grafts would be ideal but their practical difficulties lead most operators to return to skin grafts.

Small pinched-in areas may be the result of scarring of lining from infections, or from resecting too much lining in a septal resection or an osteoplastic operation Correction may require a graft, but sometimes can be effected by undermining the lining in adjacent areas and switching a small flap of intact lining over the pinched-in area after removal of scar (Fig 146) This, of course, requires that the deformity be relieved by dissecting the scar with some overcorrection if possible

The majority of pinched-in nostrils, however, are due to developmental deformities of the ala without actual loss or scarring of mucosa The chief complaint in these patients is nostril collapse and stoppage on sudden or strong inhalation, it is due to the nostril apertures being so reduced by the alar deformities that they collapse under the pressure of sudden or strong suction (Fig 147)

Figure 147 Developmental pinched in nostrils corrected by reconstruction of alar cartilages

The alar cartilages in these patients are hypertrophied in length, but have a depression along the superior border of the lateral crus Such deformities could be produced by tics or habit spasms of the constrictor and depressor alı muscles over a long period of time However, once the deformity is produced, the cartilages are irreversibly molded in this position and the correction is by cartilage operation, and not on the muscles

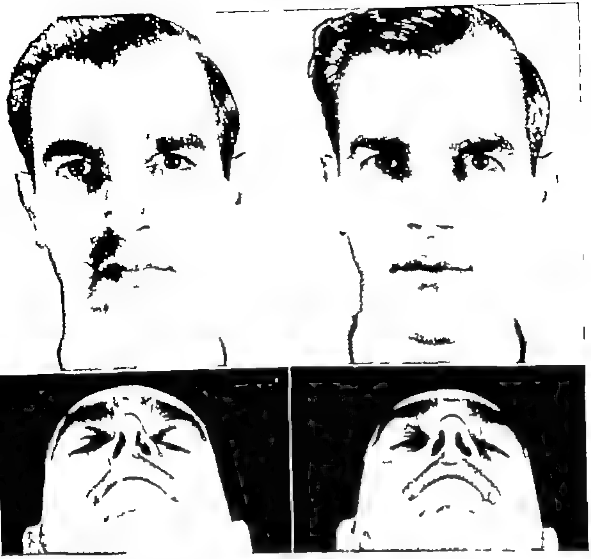

Figure 148 Developmental pinched in- nostrils which collapsed on inhalation. Insertion of cartilage transplants or other substances into these nostril walls thickens them and collapses the airway still further Correction was by resection of the pinched in areas of the alar cartilages and then shortening the nose until the remaining segments of the alar cartilages can be supported by the lower ends of the upper laterals.

The correction is by excision of the depressed strip along the upper border of each lateral crus and then shortening of the nose without shortening the upper laterals very much so that in repositioning the new upper border of each lateral crus will be supported by the tip of the corresponding upper lateral (Fig 148) In stages this consists of (1) the usual opening incisions (2) undermining the skin (3) any bony work that may be advantageous (4) shortening the septum as needed (5) exposure of the alar cartilages by rim incisions or eversion and trimming off the depressed upper edge (6) repositioning the new upper edge of each alar cartilage over the tip of the corresponding upper lateral cartilage This constitutes a complete

osteoplastic operation but it is seldom that anything less will provide correction Transplantation of slivers of rib, ear, or septal cartilage into the pinched-in ala simply thickens it and depresses it more, so that function may be worse instead of better by this procedure

Chapter X

SUTURING, POSTOPERATIVE SPLINTING AND CARE

At the conclusion of the operation blood is pressed out of the nose and the cartilages and bones are carefully molded into their proper positions (Fig 149) The nose is studied in front, profile and bottom views and may be lightly palpated with the bare fingers for any residual sharp edges or prominences that might not be seen A further check is made by examining the removed segments (Fig 150) for symmetry and by comparing the completed nose with the plaster cast. Any irregular borders of mucosa skin bone or cartilage are trimmed smooth before suturing

SUTURING

After it has been determined that no additional trimming or adjustments are indicated the columella is sutured back to the septum and the other incisions are left open for drainage.

With the columella in the desired and proper position the membranous septum is carefully reunited with fine interrupted silk sutures using at least four on each side (Fig 151) to effect a smooth closure. This has the effect of putting the nose where it belongs and holding it there without the use of mattress or stay sutures such as are used in heavier surgical procedures where pulling does not make so much difference.

The columella mucosa is united to the septal mucosa and the dressing can do the rest of the fixation However because of their popular use and to bind the parts more firmly together heavier mattress sutures in through the columella back and out through the septum are sometimes used but are not relied on for the complete healing

Importance of this fine suturing is noted in absence of visible scarring of the columella when seen from the side and this is in line with the plan of eliminating the nostril rim incision which often leaves a noticeable scar

Much has been written about advancing the columella on the septum by suturing it in a more forward position than it naturally assumes This may create a temporary effect, but it will settle back to its natural position within a few weeks. The reason for this is that the healing between columella and septum is just the thin scar between mucosa and skin on each side and this has no appreciable strength The solution in the short columella or retruded tip is either to cut the nose down to the size of the tip or to support the tip forward by means of an L shaped cartilage or bone implant—mucosa will not drag the tip forward permanently

Figure 149 Method of applying pressure to nose through a gauze pad to squeeze out blood and mold fragments into shape

Figure 150 Hump and hockey stick fragments of lower lateral cartilages removed from a nose in reconstruction

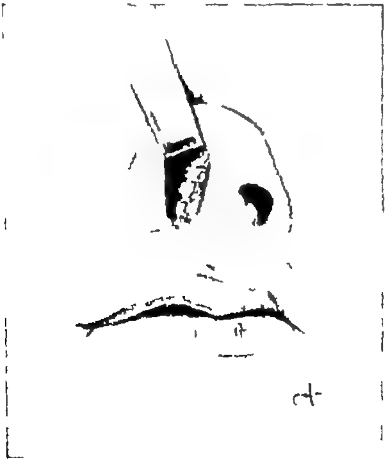

Figure 151 Careful approximation of septal mucosa to skin of columella with multiple fine sutures.

PACKING

Any blood is again pressed out and the parts are carefully molded into their final proper position. The airways are cleared by suction and the inside is examined as carefully as the outside. Small iodoform gauze packs (single thickness, one-inch, selvage-edged) are placed in each nostril, taking care to get a little between the septum and each upper lateral cartilage, and then just enough to fill the vestibule without distending or distorting the nostril in any way. Packs may not be essential, but they furnish something for any cut edges to bleed against, keep clots out of the airways, and help prevent hematomas.

SPLINTING

An adhesive cast is then applied to help immobilize and mold and protect the skin. Sterile half-inch strips are used (sterilized on crinoline backing in a formalin cabinet), applying a single or double row of cross strips

Figure 152. *Above,* sheet aluminum nasal splint flat, and bent into shape for application. *Below, left,* sterile adhesive strips applied over skin of nose to form a "cast" to mold the skin. *Below, center,* nasal splint glued onto adhesive "cast" with collodion and further molded into shape. *Below, right,* application of additional adhesive strips to anchor splint to face and to fasten gauze triangle over tip of nose.

from the tip to the glabella first, and then a single vertical strip on either side (Fig 152)

The aluminum splint is applied next (Figs 152 to 155) and this is one of the most important steps in the entire operation Up to this point the operation has consisted almost entirely of separating the various structures of the nose and trimming them The splint is used now to mold these structures back into their new proper and final positions and to hold them there until they are solidly healed Good splinting cannot turn a bad surgical result into a good one but poor splinting can ruin a good operative result. The secret of routine good results perhaps lies in routine careful splinting as much as any other single thing

Figure 153 Drawing of sheet aluminum splint covered with muslin flat, and bent into shape for application

The best splint is a thin light sheet metal one which covers the entire nose is limber enough so that the final molding and bending can be done on the nose but is stiff enough that it will thereafter hold the nasal bones and cartilages in position The best material thus far discovered is sheet aluminum 2SO alloy 0016 inch thick. This is cut into the proper pattern (Fig 153) and covered on both sides with muslin cloth glued on with rubber cement.* If tan or flesh-colored cloth is used to coat the outside the dressing will be less conspicuous.

Copper zinc lead and a number of alloys were tried at first but were all either too stiff too flimsy or too heavy

The splints are manufactured in several sizes and, in addition may be cut with a bandage scissors to the proper size for each individual patient. After a splint the proper size is selected or trimmed it is held in both hands and vertically bent in the middle until it resembles an inverted U in the bottom view (Figs. 153 and 154) The side-edges are then bent back so that they will rest flat on the adjacent cheek on either side of the nose (Figs. 153 and 155) The inside of the splint is painted with flexible collodion

* Obtainable from H C. Lahay Specialty Company 413 Forest Park Blvd., St. Louis Mo

and after drying for a minute or two, the splint is applied to the nose, molded into the proper shape and position and held there until the collodion dries, gluing it to the adhesive covering on the nose (Fig 152) The splint is applied so that it is in contact with the entire nose, is straight and is in the midline, so that the dorsum is straight and thin from top to bottom, and so that the bottom triangle is correct The splint is of uniform thickness and is thin enough so that the nasal contour can be visualized through it with some imagination

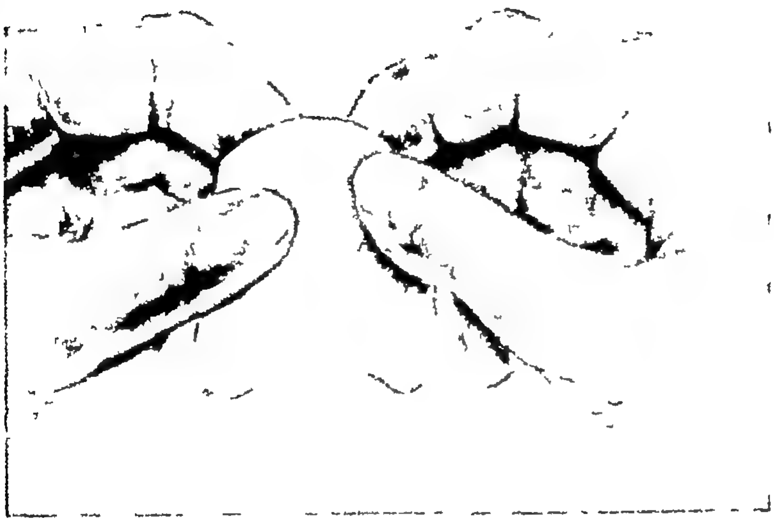

Figure 151 Hand molding of splint into shape

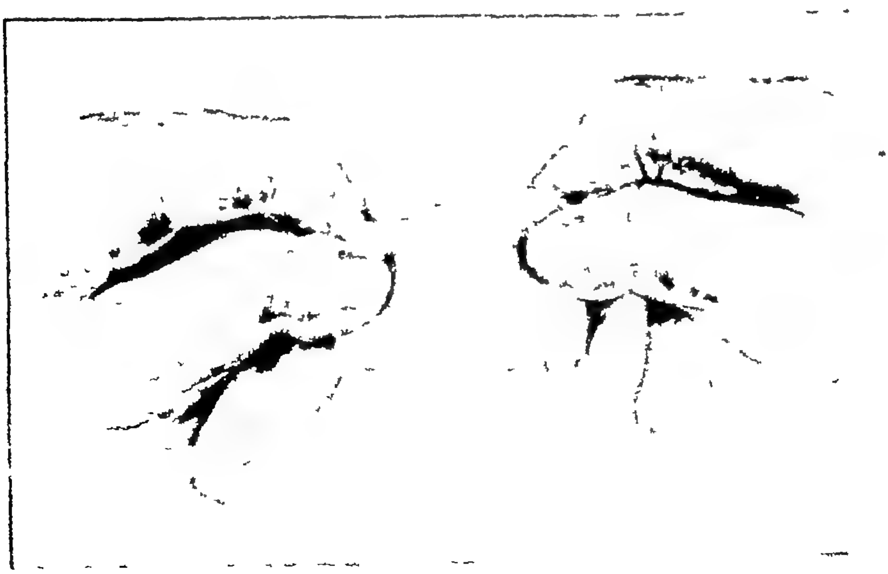

Figure 153 The edges may be flared out a little to fit closer on the face, but this is not necessary if the edges are trimmed off

A single half inch adhesive cross strap is then applied to the face to help hold the splint in place It starts under one ear lobe crosses the dorsum of the splint near the top and then extends down under the other ear lobe The cheeks are pulled forward by this cross strap so that their elasticity can be used in holding the splint firmly in position The cross strap should never go across the tip where it might depress the cartilages but should always cross the upper bony area A triangular pad of gauze is then taped over the tip of the nose to absorb any bleeding during the first day or two

The patient is sent back to the division with instructions to lie quietly in bed with the head elevated for a few hours to minimize postoperative bleeding After that time he may be up and about the room and is usually put on a regular diet Gauze flats wrung out of ice water may be applied to the eyelids intermittently for the first day to help keep down ecchymosis but ice bags or rubber gloves filled with ice or other heavy soppy contrivances should not be used The eyelids will always swell and discolor some anyway but most of this disappears within the first week.

Patients are nearly always surprised at the lack of pain but may need a little aspirin for headache or occasional doses of codeine The chief complaint is usually that of a dry throat due to mouth breathing and a little pleasant tasting mouthwash handy at the bedside is a welcome aid. Because of this mouth breathing some mild sedative at night may be useful for sleeping The routine systemic use of antibiotics for a few days is preferred by many surgeons and may be used if there is no contraindication

The use of general medication to keep the nose dry is carried out on individual preferences.

The first day after operation the patient usually looks rather messy but feels all right. The adhesive straps and lower gauze pad may be changed if necessary but useless tampering with the dressing may increase or prolong any oozing

In general these patients should not be treated as invalids or as acutely ill people, but as well individuals. This seems fairly obvious, and there is little reason to annoy them by useless unthinking regimentation or routine however well intentioned it may be

The second day after operation the packs may be removed. If there is little or no bleeding, the nostril vestibules are cleaned out with an oily solution on applicators, and the packs are left out with instructions to the patient to avoid blowing his nose If there is moderate bleeding clean gauze packs soaked in 1 5000 adrenalin are inserted as before

The patient is usually discharged from the hospital on the third or fourth day At that time the nose splint is cleaned or changed the nostrils are cleaned out with oily applicators and the patient is made as presentable as possible He is instructed to avoid unusual exertion or contacts with persons with respiratory infections and to report each day or so for further dressings.

In the history of nasal surgery, successful splinting has lagged behind successful operating. In the early days, Joseph apparently paid very little attention to it and warned his patients that their noses would not look like much until the gross swelling and hematomas had resorbed, a process which often required several months and during which the bones and cartilages might become displaced. Later he developed an apparatus which consisted of a padded leather shoe on each side of the nose connected by metal arches with a cross-screw for tightening the shoes inward. This was intended just to hold the nasal bones inward, and the cartilages, dorsum, and overlying skin were still not under control.

Since these early beginnings, other workers have developed a great variety of splints, only a few of which can be mentioned here. Splints which attach to a plaster head cap, or to a head mirror band are inferior in that they move; if it were possible to anchor them solidly to the scalp, it would still be impossible to keep the scalp from moving on the skull. Plaster of Paris has been used by many surgeons, particularly those with orthopedic tendencies. However, its weight may tend to distort the cartilages and depress the nose, and it is unnecessarily bulky and messy for both the surgeon and the patient. Dental wax has been used quite successfully by some surgeons, but considerable skill, speed, and judgment are required to have it in exactly the right shape every place on the nose at the instant it passes through its critical point and hardens. This last criticism also holds to a lesser extent for plaster of Paris.

POSTOPERATIVE OFFICE CARE

The dressing is removed, the nose cleaned out, and a new splint snugly applied every second to fourth day. If there is a good deal of congestion from edema of the mucosa, the patient may be allowed to use mild aqueous nose drops occasionally for constriction, but in general complications are fewer if the patient does not tamper too much with his nose. Forceful spraying inside the nose does not seem to be a good practice.

The sutures are removed about the tenth day and the splint may be left off as soon as the bones and cartilages are solid and most of the swelling has subsided. This is usually between the tenth and fourteenth day, but may be a little later in patients with thick skins (Figs. 156 to 158). There will often be a little residual swelling to go down after the splint is left off, and it may be a few weeks to several months before the nose assumes its final appearance. However, the nose will appear grossly much better from the time of operation, and if gross swelling is controlled by tight splinting during the first two weeks, the improvement will be much more rapid (Figs. 159 and 160).

Most patients will be enthusiastic about the improvement in appearance right away, and these people in general are perhaps the happiest of all sur

Figure 156. Appearance of nasal correction just one week after operation Swelling has been kept to a minimum by tight splinting However such a nose should be supported five to seven days longer

Figure 157 Appearance of nasal correction two weeks after operation Splint may be left off at this time

gical patients. However, a few patients who have had very large cutdowns may require a little time to become accustomed to looking at a normal sized nose on their face. Older patients have more trouble adjusting than younger ones. Anticipating this with them and understanding during this period will do much to help them in their readjustment. The common improvement in outlook and rehabilitation of personality in these patients are some of the most gratifying results in all surgery.

Figure 158. Front and lower views of same nose as that shown in Figure 157. Some little residual swelling still present.

Figure 159 Appearance of large nasal cutdown three weeks after operation Splint ha[s] been off nose for one week and there is very little residual swelling

Figure 160. Another nose three weeks after operation and one week after splint has been off Practically no swelling in this patient but in those with thick skin some swelling may persist much longer than this.

COMPLICATIONS

As in all surgery, complications will occur occasionally in these operations, but they are fortunately quite rare after the surgeon gains some experience with the procedures

Infections are rare indeed, possibly because of the excellent blood supply of the nose The few that do occur usually arise in hematomas or around retained sawdust or loose bone chips Prevention consists of not operating on anyone with an infection in or around the nose, good pressure splinting to keep out hematomas, and care in cleaning out sawdust and loose bone chips after each bone-cutting procedure Routine prophylactic therapy with antibiotics may be used, and in any event should be continued or started if infection becomes evident Any abscesses can usually be evacuated through the intranasal incisions without the necessity of external scars Pressure over the nose should be maintained by good and continuous splinting, as boggy, edematous tissues have poor resistance to infection

Skin pustules will occur occasionally, usually around the lower part of the nose in patients with large pores and retained collections of sebum Prevention consists of emptying these pores during the operations, using sterile adhesive in the dressing, changing the dressing more often than in the average patient, and the routine prophylactic use of antibiotics Perhaps most important of all is to avoid operating upon people with this type of skin, or people who are prone to acne, whenever possible However, some of these people are so desperately unhappy with their nasal deformities added to their skin disfigurement, that the risk is worth-while In these instances, it may be advisable to dress the noses with a layer of fine mesh antiseptic grease gauze next to the skin, using the forehead type of nasal splint shown in Figure 161, and changing the dressing every day Any pustules which do occur should be evacuated as early as possible, and may be treated locally with any antiseptic or antibiotic of choice

Hemorrhage is uncommon, but exceedingly annoying, and when it once occurs, it is likely to be repeated at intervals for a week or more It is occasionally due to abnormalities of the clotting mechanism, but is more often due to an abnormal single vessel or to a low-grade infection Every nose bleeds some during the first forty-eight hours, and many noses bleed some when the packs are removed the first time However, bleeding of any consequence after that time is definitely abnormal and should be so treated When possible in such instances, the interior of the nose is examined through a nasal speculum with a good light and suction If the bleeding comes from a single spurting vessel, a small gauze pack (soaked in weak adrenalin) is placed tightly over the bleeding point It is important to avoid distorting the nose at this time and risk compromising the surgical result,

as a large pack does not do any good except for the small portion of it that is right on the bleeder These single spurting vessels are usually on the lower part of the septum or in the mucosa along the lower border of the upper lateral cartilage The packs should be changed every day or two until the bleeding ceases and then immediately left out. Good pressure splinting is maintained and the patient is warned to avoid blowing his nose or picking at it or sneezing and to keep reasonably quiet.

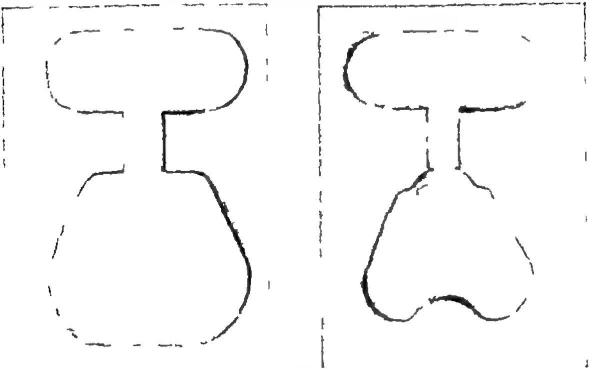

Figure 161 Drawing of sheet aluminum splint with forehead attachment, flat, and bent into shape. The upper band of this splint is attached to the forehead with adhesive strips, and adhesive strips attached to the cheeks cross over the upper nasal portion so that it is not glued on with collodion. Such a splint may be used when it is necessary to cover the skin of the nose with grease gauze (e.g skin grafts, abrasions, suture lines, acne etc.)

If the bleeding consists of diffuse oozing from many different points it is best to hospitalize the patient again. These are the patients most likely to experience trouble for the longest time Routine examinations are made for any disturbance in the clotting mechanism and indicated treatment is instituted. Most of these disturbances are probably due to an edematous mucosa with a low-grade diffuse infection Antibiotics may be used systemically and locally or the local treatment may be carried out with some topical antiseptic of choice Packs will be necessary but should be changed frequently to try to dry out the mucosa They will have to be applied against all of the mucosal surfaces in the anterior part of the nasal cavity and good splinting should be kept up to maintain the correct shape of the nose Such

patients occasionally bleed enough to require blood transfusions, but the whole process usually subsides in a few days to a week under the described regime, plus keeping the patient quiet in bed, using sedatives as necessary

Chronic or repeated hemorrhage is annoying to both the patient and the surgeon and particular care is necessary to avoid doing harm or disturbing the shape of the nose If proper care is taken, the final shape of the nose will usually be just as good as though the hemorrhage had not occurred There is no need in these noses for local treatment with tannic acid or other corrosive or escharotic chemicals, or the introduction of crude stubstances Patience and persistence in applying the procedures outlined should solve the problem in each instance

Residual deformities are usually from unpredictable distortions which occasionally occur in the healing process, may be the result of mistakes in surgical planning or execution, or in postoperative care They are due more often, perhaps, to the surgeon being willing to help someone with a nose of an original type (extreme deformities, thick skin, etc) that precludes the possibility of a perfect result These noses can usually be differentiated in the original examination and operation refused, unless it is thought that the patient will be satisfied with the maximum improvement obtainable, even if it will be considerably short of perfection In any event, the only further remedy is by secondary operation (as discussed in Chapter XXII), and this is delayed until all swelling has subsided

Dissatisfaction on the part of an occasional patient may be due to residual deformity of the nose, or to a personality defect that cannot be corrected by operation Fortunately, these are both uncommon If it is due to a residual deformity that lends itself to secondary correction, that is often the best solution Marked personality defects which are almost certain to interfere with final success usually can be picked up on the initial examination, but less evident defects may be missed by surgeons using the greatest of care Patients have been seen with almost perfect noses who drift from one surgeon to another trying to get someone to operate upon them

It is particularly important to be charitable toward the first surgeon in the case of a dissatisfied patient with or without residual deformity The patient may gloss over or choose to ignore the fact that he originally had an extreme deformity, or an exceptionally difficult correction If he is unhappy with a considerable improvement in such a nose, he may be more unhappy with the lesser degree of improvement obtained by some secondary procedure This does not preclude doing secondary corrections on such patients, however, when it is thought worth-while to do so

SECTION 3

BUILDING UP AND STRAIGHTENING THE NOSE

Chapter XI

BUILDING UP THE NOSE BY OSTEOPLASTIC PROCEDURES

In some old fractures where there has not been loss of bone but only a mashing down the bones may sometimes be elevated out of the face and suffice for the dorsal height (Figs. 162 and 163) This procedure might be thought of as a secondary or late fracture reduction but since the bones are solidly healed it is necessary to separate them by sawing or chiseling before replacing them

In the squashed type of frontal fracture the nasal bones and often the frontal processes also are pushed outward as the dorsum goes down thus converting the original height of the nose into excessive width Correction in these noses consists of narrowing the bones to elevate the dorsum thus converting width back into height (Figs 164 and 165) The procedure is usually not applicable where there has been suppuration from septal abscesses or osteomyelitis or where there has been a series of fractures severe fractures during the growing period or known loss of substance It should not be used in soft floppy noses with loss of septal support. However in some very badly depressed wide noses where it is known that a cartilage or bone transplant will be necessary it may be advantageous to do a preliminary operation to narrow the nose and gain as much height as possible before doing the transplant.

OPERATION FOR CONVERTING WIDTH INTO HEIGHT IN THE BONY NOSE

The usual opening incisions and undermining are carried out. The nasal bones are then cut loose from the septum on either side but flush with it, by a thin chisel or osteotome (Fig 166) The usual lateral saw cuts are made on either side through the frontal processes flush with the face The remaining arch of bone above is then broken by in fracturing out fracturing or cutting through the skin and chiseling through from the outside if necessary A complete break is essential after which the bones are moved inward and angled so as to elevate the dorsum. In this maneuver the two nasal bones usually come together to form an intact arch over the top of the septum (Fig 167 A) Ordinarily the nasal bones can be held inward and the dorsum forward by the lateral compression of the external aluminum splint. However if they are difficult to hold a through-and through wire sling is placed through both lateral saw cuts and through the septum and twisted up tight on either side over a lead plate as described in Chapter XIV

Figure 162 Osteoplastic elevation of old depressed fracture of nine months' duration

Figure 163 Osteoplastic elevation of old depressed fracture, converting excessive width into height, without the use of any transplant

Figure 164 Old depressed, wide fracture which was elevated and narrowed simultaneously Tip cartilages also trimmed and straightened.

Frequently the nose can be further improved by work on the upper lateral cartilages, and the tip or by shortening and any such helpful procedures might well be included in the operation

ELEVATION OF THE CARTILAGINOUS PORTION OF THE NOSE

Moderate depressions of the cartilaginous section of the nose can sometimes be built up also by converting width into height if a reasonable amount of septal support is still present (Figs. 168 and 171) At times this is done by building up the height over the upper laterals to the height of the bony nose and tip (Fig 170) sometimes a compromise is necessary in

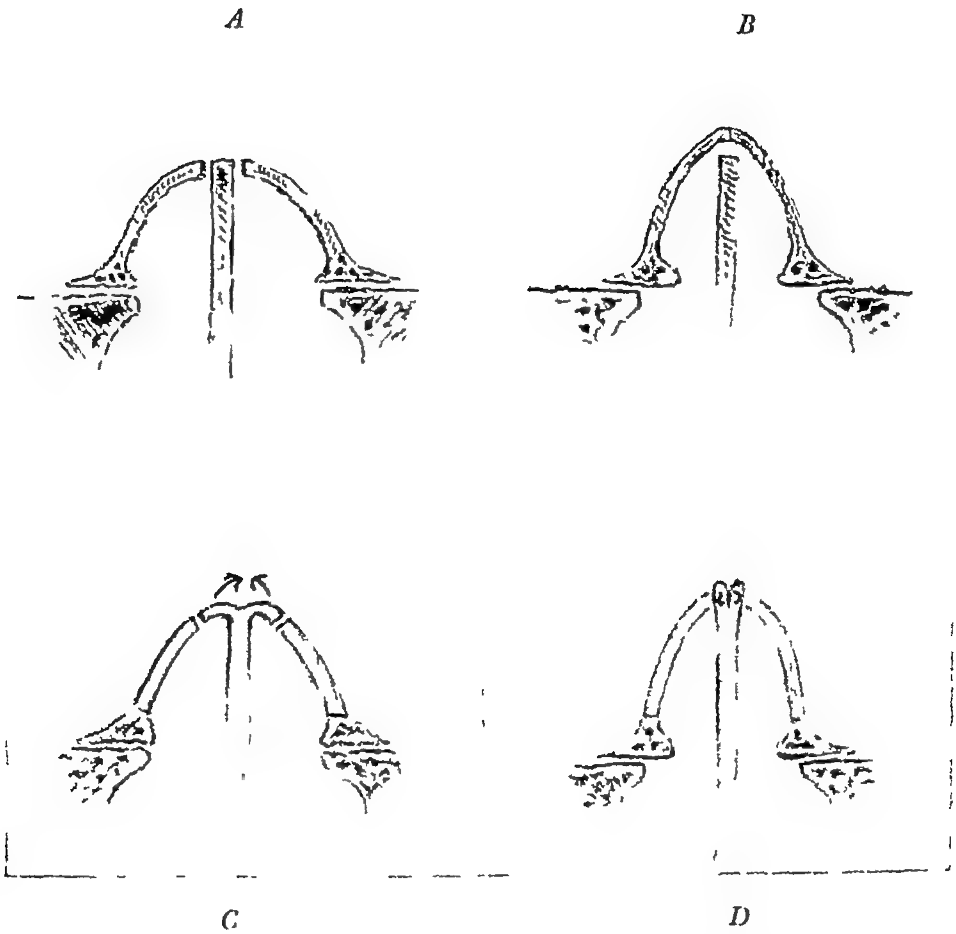

Figure 167 Diagrammatic cross section views *A* and *B*, As bases of nasal bones are moved inward the dorsal edges are forced higher and come together to form an arch over the septum *C* and *D*, Turning medial fragments of the upper laterals up over the septum to increase height in the midsection of the nose

Figure 168. Dorsal line straightened by removal of small hump cutting down height of tip and turning up sections of upper laterals to fill in the depression in the mid section.

Figure 169. Nose shortened and all available cartilage shifted into mid-section to fill depression. This nose approaches the necessity of a cartilage transplant but there was fairly good septal support. The nose was built up to the level of the bones without any hump removal.

Chapter XII

CARTILAGE AND BONE TRANSPLANTS FOR DORSAL LINE RECONSTRUCTION AND TIP SUPPORT

WHEN THERE IS LOSS of support from fracture, abscess, specific disease, or operative removal of the septum, the plan of repair includes restoration of support by means of a transplant of bone or cartilage Similar transplants are often required also in cases of congenital retrusion, deformities associated with cleft lips, and in other instances of congenital deficiencies of support

The septum is part of the "armature" or framework of the nose and governs the dorsal line in height, angle, and regularity, as well as the straightness and length of the entire nose While it is true that the alar cartilages, or even a thick stiff skin, may contribute to tip support, in the absence of septal support they leave a soft "floppy" tip which easily collapses (Fig 172) and which patients do not like The mid-section of the nose "caves in" when septal support is lost from infection, fracture, or operative removal of too much septum in this area

In comminuted fractures of the cartilaginous septum with overlapping of the fragments, solid healing does not occur Perichondrium and other soft tissues grow through and over the fracture sites so that the various fragments can be readily separated years later and will be found to have smooth, separate edges

Large, one-piece dorsal and columellar transplants provide excellent support, as well as build out the contour Though preliminary operations to straighten the bones, trim the tip cartilages, and open the airways are indicated in some patients, often an excellent repair can be provided in just one transplant operation

CONSIDERATION OF VARIOUS MATERIALS FOR TRANSPLANTATION INTO THE NOSE

Human cartilage and bone are definitely the best materials known today for nasal transplants Many different materials have been tried in the past including ivory, bakelite, polystyrenes, acrylics, Vitallium, tantalum, heterogenous bone and cartilage Foreign materials usually are healed in primarily and may persist for several months or years, but eventually become the focus of an infection, or a prominent hard edge finally works through the surface, inside or out, which results in their extrusion

Figure 172. Loss of support from septal resection with depressed and soft floppy lower nasal segment. Restoration of support and contour with single L shaped preserved cartilage transplant. No patients like this flabby quality in the nose

It is worth noting that the character of the bed is all important to the permanency of such transplants. On our service, several patients volunteered for experimental implants of various plastic materials and of wood deep in the subcutaneous fat of the abdominal wall These implants persisted for several years without gross or microscopic evidence of irritation Similar experiments on dogs even included a sterilized piece of an old shoe which persisted in the abdominal wall for a very long time without discernible reaction The point is of course that the trial of a proposed transplant under such conditions furnishes no reliable clue as to how it would behave permanently in the human nose The usual bed for nasal transplants is unique the dorsal portion lies on bone and is covered only with skin the septal portion is covered only by mucosa on each side which is so thin as to be almost transparent The entire transplant and its bed is subject to frequent trauma and to recurrent infections of varying virulence in the mucosa. In the latter it is almost inevitable that sooner or later virulent streptococci or staphylococci will gain access to the transplant and it must be able to withstand them without creating a foreign body situation for their persistence.

AUTOGENOUS CARTILAGE TRANSPLANTS

Autogenous cartilage will probably show less shrinkage than preserved cartilage in the all-over picture, and seems to have more resistance to infection It is fairly readily obtained, but this part of the operation adds materially to the postoperative discomfort of the patient Perhaps the main objection to autogenous cartilage is its distressing tendency to warp and curl in every conceivable direction (Fig 173), a feature from which preserved cartilage is free This can be prevented, in autogenous cartilage, by boiling it before transplantation, but then one is dealing with dead cartilage anyway, and the question of whether to procure it from the patient or from a cartilage bank is of little interest

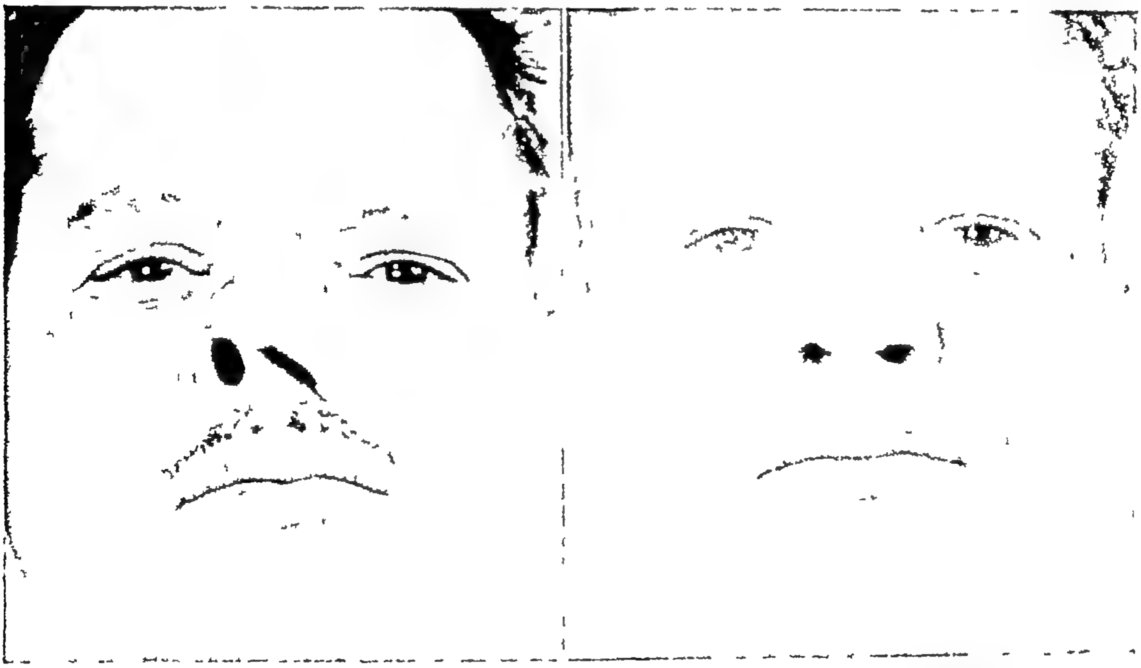

Figure 173. Extreme distortion from curled autogenous cartilage transplant done elsewhere Correction by removal, and substitution of single L-shaped preserved cartilage transplant

Other objections to autogenous cartilage are that it may not be available in suitable sizes or shapes in children, and that its quality may not be that desired in a particular patient At times, an otherwise healthy patient may have rib cartilage which is too soft and mushy for a good support, or may have so many areas of calcification which split out during the carving process that a smooth transplant of the desired shape cannot be obtained

It is a rather unique situation in surgical investigation that the continuous viability of autogenous rib cartilage transplants to the nose is unknown. Many investigators have gone into this subject with conflicting results This

is true mainly because it is so difficult to determine chemically or microscopically whether a given piece of cartilage is alive or dead The metabolic rate of cartilage is so low that measurement of its oxygen consumption or end product output is likely to be vitiated by any small error in the determination Microscopically empty lacunae or pyknotic nuclei in the chondrocytes are commonly accepted as evidences of death in a cartilage but the same changes may be produced in fixation Because it is avascular the gross appearance may be of little help

Autogenous rib cartilage transplants for the nose are usually obtained from the sixth or seventh costal cartilage on the right side removing a large full thickness segment including the angle and laterally over to the bony rib Local infiltration and intercostal nerve block anesthesia may be used but general endotrachael anesthesia is generally more satisfactory for both the patient and the surgeon

An oblique incision about four inches in length is made over the desired cartilage (Fig 174) and carried through skin subcutaneous fat rectus sheath muscle and on down to the cartilage. All of the overlying structures are then dissected loose in one layer from the cartilage and adjacent intercostal muscles and retracted for good exposure If the exposed cartilage is not satisfactory in shape or size the dissection is carried upward or downward to expose the cartilage above or below After the desired cartilage is located the soft tissues are dissected from it down past the junction with the bony rib and up about 1½ inches above its angulation

The perichondrium is cut with a knife all along the upper and the lower edges of the cartilage throughout the length which is to be removed (Fig 174) The tip of a Joseph elevator is then introduced in one end of the lower cut and tunneled through completely across behind the cartilage between it and the perichondrium This requires some force and twisting and the elevator should be kept right against the cartilage without cutting it. The end of the cartilage is then divided cutting through it with a knife down to the surface of the underlying elevator

The end of the cartilage is then grasped with a tenaculum elevated and the posterior perichondrium carefully and slowly peeled loose throughout the desired length of cartilage with the Joseph elevator It will be found that this attachment of perichondrium to cartilage is tenacious and cannot be stripped off easily in the manner that periosteum is zipped off from bony ribs so that it is removed with the transplant at times although this leaves just pleura behind. When the desired length of cartilage is free the Joseph elevator is placed across behind the other end and it is cut loose

Any remaining sharp ends are rounded off with a knife and the rectus fascia is closed with catgut or silk sutures The remaining structures are closed in layers and the dressing is fastened on with long Elastoplast strips

extending from the opposite posterior axillary line, around over the operated area to the opposite anterior axillary line. If these are tight enough to limit respiratory movements on that side, the patient will be more comfortable during the first few postoperative days.

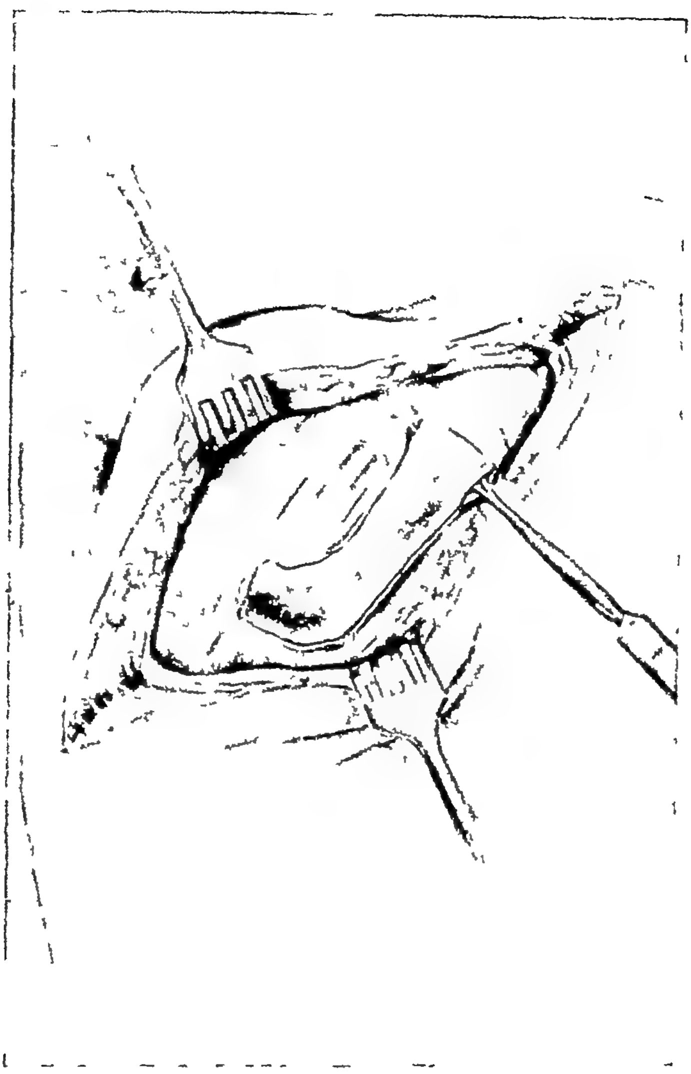

Figure 174. Removal of angled piece of autogenous rib cartilage for nasal transplant. After exposure (through a somewhat smaller incision than shown here), the perichondrium is incised along the lower and upper edges. A Joseph elevator is worked across behind the sternal end, and the cartilage cut across. With the same elevator, perichondrium is stripped from the back surface until the lateral end can be cut across flush with the bony rib.

If the pleura is nicked during the removal, it may be sutured or an assistant may hold a sponge over the hole to minimize sucking of air until the rectus sheath is closed over it. After the chest is completely closed, a pneumothorax needle may be inserted and any air drawn off. If the latter is not available, any large caliber needle may be used with a three-way connection

on a 50 cc. syringe removing as much air as possible In any event routine antibiotics are usually given postoperatively

In dealing with large numbers of patients as in military plastic surgery where hundreds of subcutaneous prostheses are used it was felt that to open every patient s chest would result in more trouble from pain extra work, and complications than would be warranted by any superiority over preserved cartilage The same would be true of fresh homotransplants unless they could be extracted and used at the moment of death of the donor

FRESH HOMOGENOUS TRANSPLANTS OF CARTILAGE

Before the development of cartilage banks homotransplants of rib cartilage from the father or mother were often used in restoring nasal support in children These have all the disadvantages of autogenous transplants and there seems to be very little reason to use them in noses now unless the parents have some strong desire to do so

PRESERVED CARTILAGE TRANSPLANTS

Preserved human rib homocartilage is used for nasal transplants unless there is a special reason for using other material It can be carved easily into the desired shape does not produce reactions has sufficient strength and does not warp or curl One can select from a cartilage bank a piece that has the right size and shape and which is relatively free from calcification Its chief disadvantages are that occasional pieces will undergo some late shrinkage in which case it may be replaced if necessary and that it has no resistance to infection in the immediate postoperative period. However fresh autogenous cartilage and bone may also be absorbed may float free from any solid attachment and may also become infected

In the accepted theories of transplantation one would expect homotransplants, dead or alive to incite allergic reactions except in the case of identical twins as no other individuals are genetically alike However homocartilage dead or alive appears to be almost entirely inert. Perhaps this is due to its avascularity or to its exceedingly low metabolic rate and end product output. It is also possible that all cartilage matrix is identical or nonspecific, or dead and that the chondrocytes which are mostly missing in preserved cartilage are the only specific and alive portions of any cartilage

In any event, preserved homocartilage has the fortunate qualities of inertness and persistence There is some evidence that it forms the scaffolding and raw materials for creeping replacement by the cells of the host It is possible that wandering histiocytes or other cells from the host gradually invade it from the edges semidigest the old matrix, and use the particles from it to create a new matrix. This same process may possibly take place in autogenous and fresh homotransplants. Whatever the explanation pre

served cartilage does persist in some manner, so that biopsies taken weeks, months, or years later look grossly like normal cartilage, and microscopically like normal cartilage matrix, but with many empty lacunae, sometimes some pyknotic chondriocytes, and more rarely a few chondrocytes of questionable viability.

The use of preserved human rib homocartilage transplants in noses seems well established now. Cartilage from other areas such as the knee would probably suffice except that their source would not be very abundant.

Zoocartilage from other species might be thought to be ideal, but the supply from even small animals' chests has a central core of calcium, and from beef the supply such as at the scapula is too elastic in quality. There are reports of successful beef cartilage use and this will be most welcome to plastic surgery. So far, however, we have had so many violent extrusions of beef cartilage that it has not been relied on in running an active service.

MAINTENANCE OF A CARTILAGE BANK

Although small amounts of excess cartilage from autotransplants may be placed in the bank, the chief source of material is from post-mortem examinations on young adults. Protection from the dubious possibility of transmitting syphilis may be had from the other post-mortem findings, and from serological determinations on the blood. Cartilage from post-mortem examinations on other types of patients may also be used, provided that patients with neoplasms or infections are excluded, although it is extremely doubtful that any of these could possibly be transmitted in this manner.

The cartilage may be removed by the same sterile technique used in the operating room when possible, but cartilage removed under ordinary sanitary and clean conditions is satisfactory. It is most important in removing it to get as many solid "angles" as possible. This necessitates a wider costal opening than in regular autopsies in which cartilage incisions go through the angles.

All soft tissue and perichondrium are dissected off the cartilage immediately, or sometime during the next day or two. In the latter event, the cartilage should be refrigerated, but not frozen, until it is cleaned. In cleaning it, the angles, usually from the sixth and seventh ribs, are sorted out to be kept together in one jar. Any hard, yellow, porous, spongy, or badly calcified cartilage is discarded.

The cleaned angles are then placed in a sterile glass jar and covered with 1:1000 aqueous merthiolate (or 1:1000 merthiolate in physiological saline) solution, and kept in a refrigerator at 4° C for one week, with the jar sealed. At the end of this time, a few little chips of cartilage are cut off with sterile instruments and cultured. The solution is poured off, replaced with 1:5000 aqueous merthiolate (or 1:5000 merthiolate in physiological saline) and

placed back in the refrigerator At the end of the second week the cartilage is again cultured If both cultures are negative the cartilage is ready for use. Cultures are repeated every week and the cartilage may be used up to one year or possibly longer after removal If any culture is positive the whole jar of cartilage is discarded. Other antiseptics may be used alcohol was used when our bank was started in 1928 but it is more difficult to wash off before using

The bank is located some place in the operating suite where the nurses can keep a constant check on the temperature and where the refrigerator will not be put to any other use In taking cartilage from the bank the sealed jar is taken into the operating room briefly opened and the desired piece removed with sterile forceps. No cartilage is ever put back into the jar and it is sealed and put back into the refrigerator immediately after the piece is removed. The piece that is to be used is washed thoroughly in sterile saline

The bank functions best when it is the continuous responsibility of some one individual to maintain it. It requires painstaking work and careful checking but it is well worth while in the saving of discomfort to patients and in procuring the best possible transplants

THE L-SHAPED CARTILAGE TRANSPLANT

For adequate restoration of support and build up a cartilage transplant should contain two components a dorsal segment and a septal segment. It is much better if these two segments are contained in one solid transplant, carving it somewhat in the shape of an L (Fig 175) Such a transplant can be readily carved from the angular portion of the sixth or seventh costal cartilage. Its superior long end will rest on nasal bone in the glabellar region and the bottom of the septal portion will rest on the stump of the

Figure 175 Lateral and dorsal views of carved L-shaped cartilage transplant (either autogenous or preserved) which is used routinely in noses. This one-piece transplant provides better support than the cantilever or two-piece varieties.

septum or nasal spine The larger the septal portion, the less will be the tendency of the transplant to twist, slip, or otherwise become displaced The whole inferior edge of the transplant should have support if possible on the remaining septum or on the maxilla

The dorsal section of the transplant is carved from the long or sternal portion of the cartilage, and the septal section is made from the short or rib end The length of the dorsal section and the height of the septal section are measured on the previously worked-up plaster cast of the patient, or may be measured on his nose during the operation after it has been loosened and distended to the desired contour The piece of cartilage selected from the bank must be large enough for these measurements with the dorsal edge of the new transplant cut lengthwise through the thick central area of the long end of the cartilage

The actual carving is usually done on a separate sterile table on which there is just the cartilage, a No 15 knife, an Allis forceps, and a sterile hardwood block about 4 x 4 by 2 inches With the cartilage held flat on the board, a straight longitudinal cut is made completely through the long section of the cartilage, parallel to the edge but just above its thickest middle area This cut surface will form the new dorsum The next cut is made at a right angle to it, as low as possible on the short rib end of the cartilage At times this angle will vary from 90°, but this can be determined from study of the nose or plaster cast This second cut surface will be the bottom or columellar surface of the new transplant

Following this, the length of the required dorsal section is measured and any excess cut off at right angles The height of the required septal strut is likewise measured and any excess cut off a little obliquely, a little longer toward the inside of the transplant than down in the nasal spine area, in cases of doubt, it is best to leave a little extra height at this time

The undersurface of the dorsal section is then cut out to conform to the present dorsum of the nose, the wax or clay build-up on the plaster cast will help in determining the profile dimensions and contour of this section. The inner surface of the septal strut is cut to conform to the size of the prepared bed within the septum, bearing in mind that the largest possible septal strut will give the most stability The upper end is made as a blunt angle rather than a long boat shape This gives a better and more solid fit at the glabella

At this point, the work proceeds better if the surgeon picks up the transplant in his hands and carves it in much the same manner that he would whittle an object out of wood The septal portion of the transplant is thinned to the normal thickness of septal cartilage, care being taken to center it properly with respect to the dorsum The dorsal surface of the transplant is rounded on the edges and otherwise trimmed to the normal contours

of the dorsal skeleton of a nose (Fig 175) The transplant is then ready for a trial fitting and will probably require very little further trimming

In the past some surgeons have tried to get along with only a dorsal strut, relying upon a cantilever effect. This may work where there is a good bony platform above and where most of the build up is to be in the upper dorsum without the necessity of elevating the tip very much In the latter instances a cantilever graft may behave like a seesaw with the stretched soft tissues pulling the lower end of the graft down and tilting the upper end out underneath the skin (Fig 314)

At times various workers have also used separate dorsal and columellar struts either as two single pieces or hinged together by perichondrium or periosteum or sutured together in some manner All of these arrangements are quite unstable and will not work out routinely as successfully as the single L-shaped transplant. The latter is supported above on the nasal bones below on the septal stub and nasal spine region and has wide placement within the septum to prevent twisting It will support the nose solidly within the limitations of the strength of the cartilage. When more force is required it usually means that the soft tissues are too small and even bone under such circumstances may undergo partial late resorption because of the pressure.

The use of a small strut in the tip alone is so uncertain of uniform results as to be employed only with great caution

OPERATION FOR INSERTION OF L-SHAPED CARTILAGE TRANSPLANT

The work is usually done under local anesthesia blocking the nose as for an osteoplastic operation Novocain may also be used for separation of the septal mucosa on the two sides to aid in dissection A columellar-splitting incision is used going from just below the tip down through the base of the columella and 2 or 3 mm on to the lip (Fig 176) Other incisions such as those in the nostril or in the membranous septum or the obsolete columellar lift incision are thought not to be as generally satisfactory or as safe as this incision The external scar involved is negligible in comparison with the advantages.

A single hook is then placed in each end of the incision and the entire columella pulled downward while the nostril border is retracted upward to expose as much septum to view as possible Curved dissecting scissors are inserted into the incision and the two mucosal surfaces of the septum are separated by spreading of the scissors the lower end of the septal cartilage is usually missing in these patients. A large bed is prepared (Fig 177) care being taken to avoid puncturing the mucosa on either side at any point. If there is some remaining septal cartilage in this area the mucosa is elevated

from either side of it with a septal elevator, and the cartilage is removed if it is in the way. A small septal segment means an unstable transplant, so that a large enough bed must be prepared Similarly, the bottom of the bed along the hard palate must be smooth, and a chisel is used if there is too much bony irregularity at the region of the spine

avoid puncturing the mucosa at any point. These maneuvers will make for a thinner tip and columella Much of the final success in cartilage transplants lies in attention to the details of preparing a proper bed

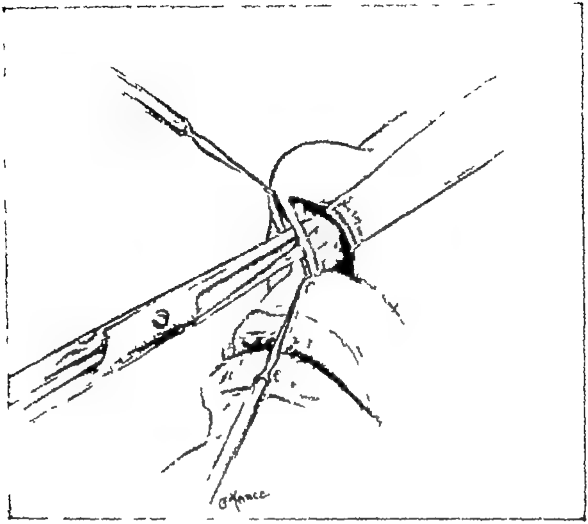

Figure 177 Dissection of a large bed within the septum for reception of the septal portion of an L-shaped transplant.

After preparation of the bed, complete hemostasis must be obtained Ordinarily external pressure with a gauze pad will suffice but occasionally it is worth while to pack the bed with one inch plain gauze soaked in weak adrenalin for a few minutes.

The transplant is now prepared and inserted for a trial fitting, trimming it further or adjusting the bed if necessary to get the desired contours and complete stability (Fig 180)

A number of small points are of importance in occasional patients at this time for instance for patients who have had an acute and retruded nasolabial angle it may be desirable to leave a little forward curved exten

sion on the bottom of the septal segment, to extend slightly into the lip and open this angle up as far as necessary

Full dorsal line replacement is considered essential for the best result Whether elevation is needed or not, the transplant should go completely up to the glabella and not be stopped any place along the dorsal line To leave the end of a dorsal support along the dorsum will always leave a noticeable break and if the transplant loosens and floats free in the tissues, very objectionable prominence of the end of it will occur

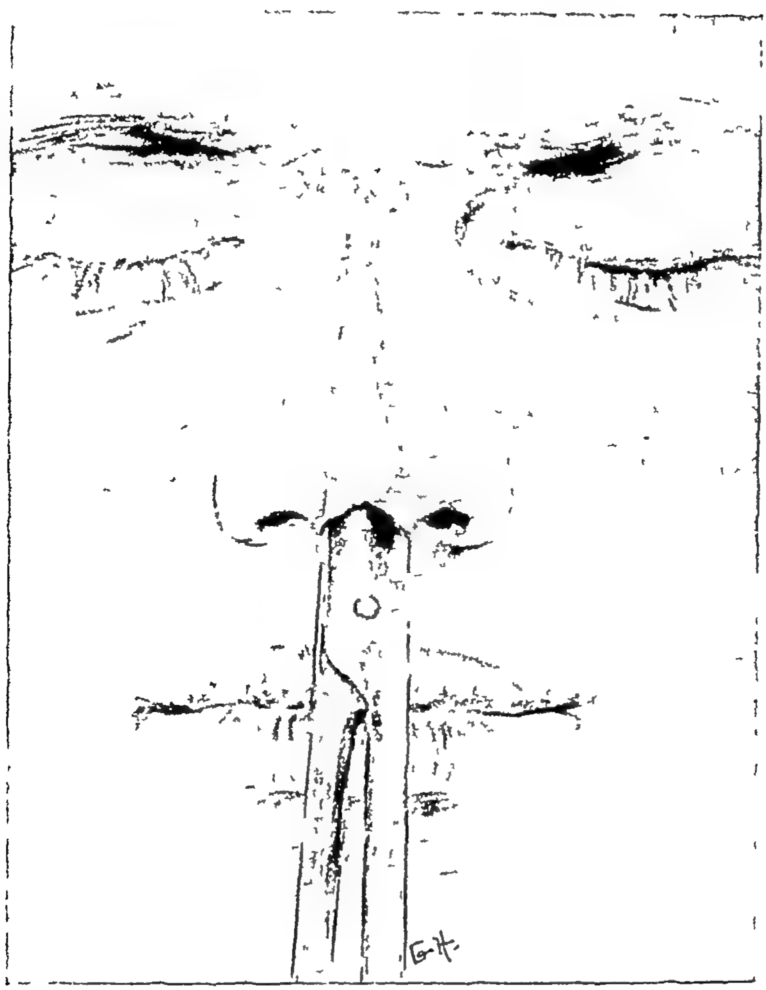

Figure 178 Dissection of a dorsal bed for reception of the dorsal portion of an L-shaped transplant

To get space for the full transplant and to prevent unnecessary elevation of the dorsum, the nasal bones and remaining cartilage, if necessary, are cut down far enough to allow a transplant of at least 2 to 3 mm thickness to be put in place

Application to bare bone above is advisable, and for this one makes sure the periosteum is raised This tends to give more permanent solid fixation

Figure 179 A flat dorsal platform is necessary to prevent "rockering" of the transplant. Any roundness or small hump in this area is taken off with an osteotome bone is always bared, and the transplant is always up to the glabella.

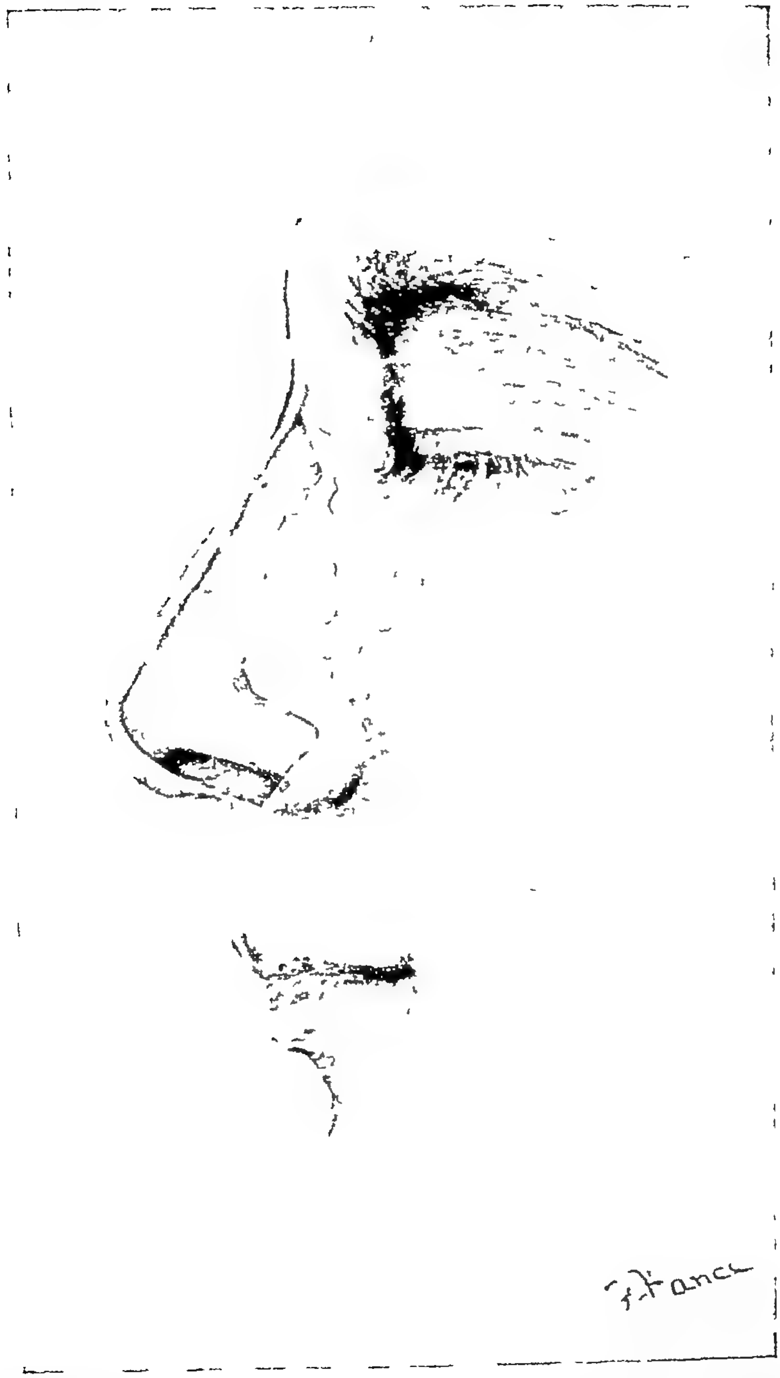

Figure 180 The L-shaped transplant in place Resting on a flat, dorsal platform, and on the upper surface of the maxilla, with the septal segment to prevent rotation, it is practically immovable

than if the cartilage is laid on soft tissue Unfortunately many times there is no bone available and such transplants necessarily must be supported only by soft tissues or remaining cartilage

The columella is closed over the septal segment with buried interrupted 000 white silk The deep closure keeps the transplant from coming down into the columella If it does the columella will be too thick the normal septum stops at the membranous septum

Further fixation of the relations between the columella and septal segment may be obtained by putting a through-and through suture through the membranous septum but this adds a route for infection to the transplant. The columellar skin is then closed with fine black silk (Fig 181) The nostrils are lightly packed the usual external aluminum splint is applied a strip of grease gauze is placed over the suture line and a gauze triangular pad is anchored over the bottom of the nose with adhesive strips.

The patient is kept on antibiotics for a few days and the nose splint is changed in the same manner as in osteoplastic operations The packing can

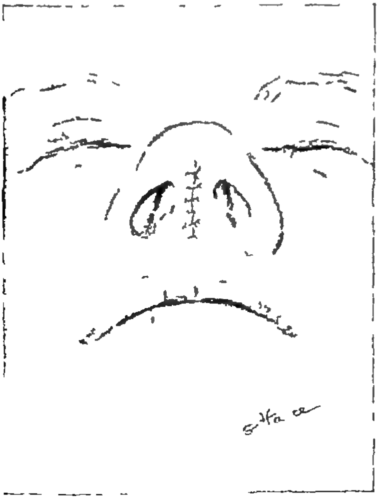

Figure 181 The columella is closed beneath the transplant with deep sutures of fine silk, and then with skin sutures shown here

usually be left out after the second day, the sutures removed on the fourth or fifth day, and the dressing removed around the tenth or twelfth day The transplant is usually quite solid by this time and the change in appearance is often dramatic (Fig 182) Breathing is often greatly improved by elevation of the tip of the nose in these patients

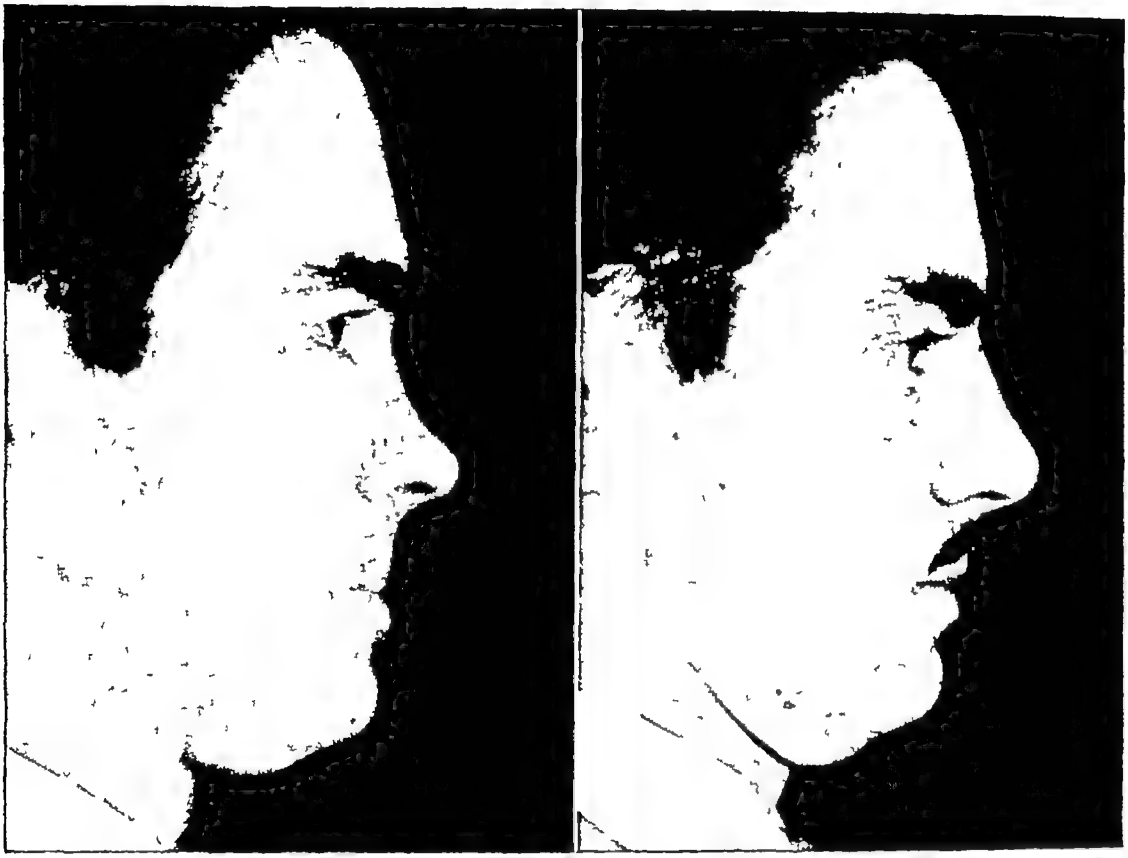

Figure 182 Marked improvement in appearance from single L transplant of preserved cartilage, shown two weeks postoperatively

Complications are few in this operation Autogenous cartilage may warp and thus require secondary trimming or replacement (Fig 173) Infections of preserved cartilage might be expected occasionally, but are quite rare They are nearly always secondary to hematomas and are best prevented by complete hemostasis before inserting the transplant and pressure dressings with aluminum splints, plus keeping the patient quiet for a few days after operation When there is an infection, the area should be drained through the lower part of the columellar incision or through the inside of the nose Ordinary cleansing care and frequent changes of sterile dressings are done The patient is kept on antibiotics and the transplant is not removed immediately, since the infection may subside and leave the transplant healed in place

Cartilage transplants can be fractured by forceful blows later, but it apparently takes about as much force as would ordinarily be required to fracture the nose or septum. Preserved cartilage will sometimes undergo some later absorption in rare instances enough to require a new transplant. So also may fresh autogenous cartilage and bone.

These operations are usually successful and contribute much to the happiness of patients.

Figure 183. Good result from use of L-shaped bone transplant for correction of nasal retrusion.

BONE TRANSPLANTS

Bone (Figs. 183 and 184) can be used instead of cartilage and is favored by some workers. It can be put in as a simple cantilever dorsal segment or with a columellar strut added or with both pieces combined in a single L-shaped transplant. As with cartilage the latter shape seems preferable for greatest support and stability.

Cortical bone has greater initial strength than cartilage but cancellous bone makes the best transplant. The latter has about the same strength initially as cartilage, but is more irregular and more difficult for fine shap-

ing, though gross patterns can readily be cut out As one works with more of these depressed noses, it becomes more apparent that the soft tissues must be loosened enough so that great strength is not required in the transplant, as even bone will undergo partial resorption in time if it is under heavy pressure Evidence is increasing that bone transplants, like cartilage, do not actually persist in the original state, but furnish the framework and raw materials for creeping replacement

The best donor site is the crest of the ilium, laterally An incision is made over it, carried straight down to the bony edge, and the muscles and periosteum are raised with a periosteal elevator from the crest and the adjoining inner and outer surfaces With a large, wide, thin osteotome, a long, thin, deep trench is cut just inside the outer cortex, and a similar one is made just outside the inner cortex This isolates a large block of central cancellous bone, which is then removed in one piece with thin curved chisels or osteotomes The soft tissues are closed and the block of cancellous bone is trimmed to shape with large bone-biting forceps and rongeurs, care being taken to avoid splitting it Gross shapes can be cut out quite readily, but the honeycomb texture of the bone prevents fine shaping

Figure 184 Traumatic loss in upper segment of nose, with good septal support remaining Small dorsal transplant of bone used to get bony union A loose piece of cartilage in this situation might readily become displaced

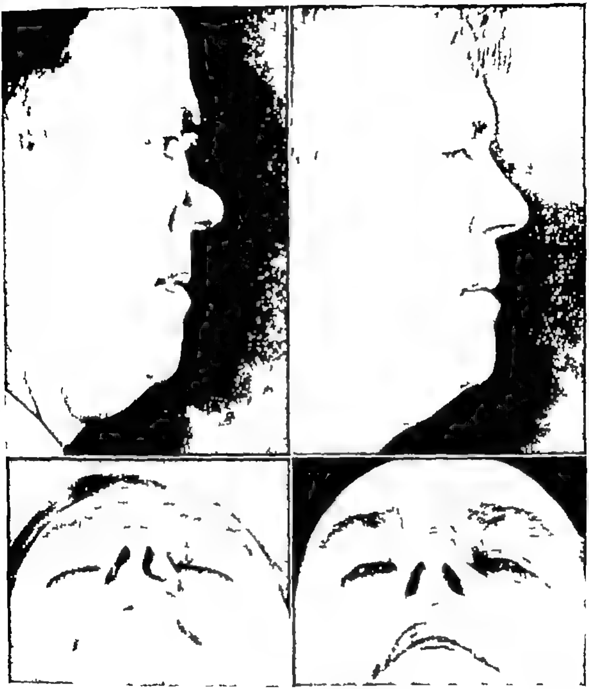

Figure 185 Old depressed fracture Correction in one operation with large single L shaped preserved cartilage transplant.

The transplant is inserted into the same type of prepared bed as a cartilage transplant and the postoperative care is similar The upper end of a bone transplant may unite with the nasal bones contributing to solidity but the greatest factor in permanent position and solidity is the construction of the bed as outlined before

Bone banks can be maintained in the same manner as cartilage banks

and preserved bone seems to do very well in many situations, although the experience with it is not as great as with cartilage

FOREIGN BODY, ZOO, AND PLASTIC TRANSPLANTS

These will be the ideal when one can be found to be permanent in a large series Much work is being done on these, but here again for running an active service and doing many transplants, the material is suggested that has had the widest use

TREATMENT OF OLD DEPRESSED FRACTURES

Most old fractures that are badly mashed down will require a cartilage transplant for best correction (Figs 185 to 189) This is particularly true if the fracture occurred during the growing period of the patient

If the nasal bones are too wide, in addition to being flat, when the patient is first seen, a preliminary osteoplastic operation can be done to narrow the bones and elevate them as much as possible as described in Chapter XI

Figure 186 Entire nose and middle third of face driven back in automobile accident with depression just beneath the forehead most striking Result of single operation with L-shaped cartilage transplant

At the same time any irregularities and bulbousness in the tip cartilages can be trimmed out, and a septal resection can be done to clear the airways. The latter can be as radical as necessary, since the cartilage transplant is to be used for support anyway.

The cartilage transplant is inserted in a separate operation one or two months later.

Figure 187. Nose driven back in car accident, with correction in one operation with preserved cartilage transplant. In addition to elevation of the dorsal line into proper relationship with the forehead, the hidden columella is brought down into view.

TREATMENT OF SADDLE NOSES FOLLOWING SEPTAL RESECTIONS

Though repetitious, it may be stated again that the septum is the support and "armature" of the nose; when too much of it is resected, the dorsum of the nose will cave in (Figs. 190 and 191). Prevention consists of straightening up a badly distorted septum as much as possible (as described in Chapter XIII) and resecting only that portion which cannot be straightened. In any septal resection an L-shaped support of normal septal cartilage at least

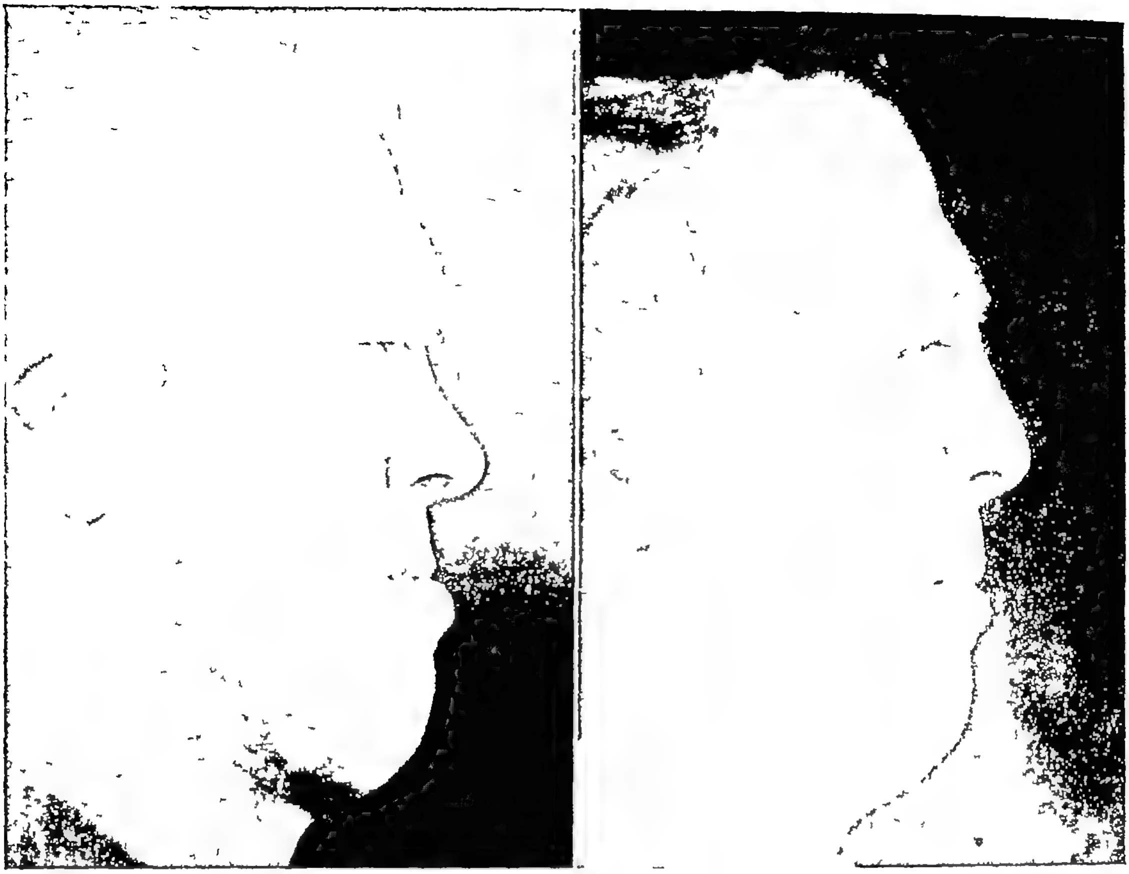

Figure 188 Total smash-in of face with orbital, pyramidal, and nasal fractures Cartilage transplants to both orbital borders, crossbar transplant behind lower end of nose, and L-shaped cartilage transplant within nose

cm wide along the dorsum and behind the columella must be left if the nose is to maintain its shape if a hump is being removed or if the nose is being shortened at the same time provision must be made so that at least 1 cm is left after these procedures

A septum may be so badly distorted occasionally that a radical resection is done with the understanding beforehand that the dorsum will collapse and that a cartilage transplant will be necessary later This permits clearing airways in situations that would otherwise be impossible.

Small cave ins over the upper lateral cartilage region can sometimes be corrected by narrowing the nose and folding over upper lateral segments as described in Chapter XI However most of these collapsed noses will be corrected better by full restoration of support from an L shaped cartilage transplant as outlined earlier in this chapter

Figure 190 Cave in above tip and loss of nasal support from septal resection Restoration with single L cartilage transplant.

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Figure 189 Front views of same patient as Figure 188

Figure 192. Congenital nasal retrusion with no septal support. Repair by single L-shaped cartilage transplant.

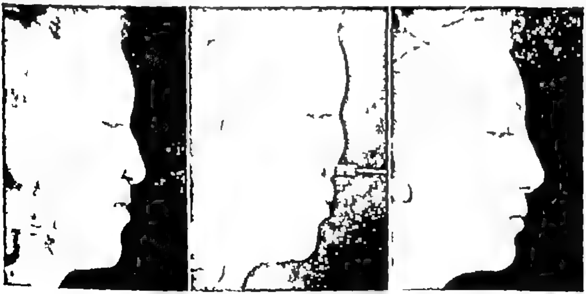


Figure 193. Congenital nasal retrusion with very soft spongy lower segment. Restoration of support and contour with preserved cartilage transplant

TREATMENT OF CONGENITAL RETRUSION OF THE NOSE AND MIDDLE THIRD OF THE FACE

These noses are so extremely difficult to change that the attitude toward them may be "the less said, the better." However, many of them can be markedly improved by insertion of a large, L-shaped cartilage transplant (Figs 192 to 194)

In addition to the main transplant, a crossbar transplant, put in horizontally across the face behind the base and columella, will help in bringing forward the nostril bases and floors, as well as the adjacent cheek areas (Fig 195) This crossbar transplant is best done as a preliminary operation, care being taken to avoid penetration of the oral mucosa or floor of the nose At the second operation, the forward end of the bottom of the L-shaped transplant will rest on the crossbar

Figure 194 Congenital nasal retrusion This is one of the most difficult of all nasal repairs, but can be markedly improved by cartilage transplants as shown in these patients However, the transplants must be designed to provide good support forward and it is doubtful if this can be accomplished by cantilevers or two piece transplants

The anatomical anomalies vary somewhat in these patients Most all of them have absence of the lower end of the septal cartilage and nasal spine, some have complete absence of all cartilaginous and bony structure in the septum, just the two mucosal surfaces being present Many have retrusion of the adjacent cheek and nasolabial fold areas, with a "pinched-in" expres

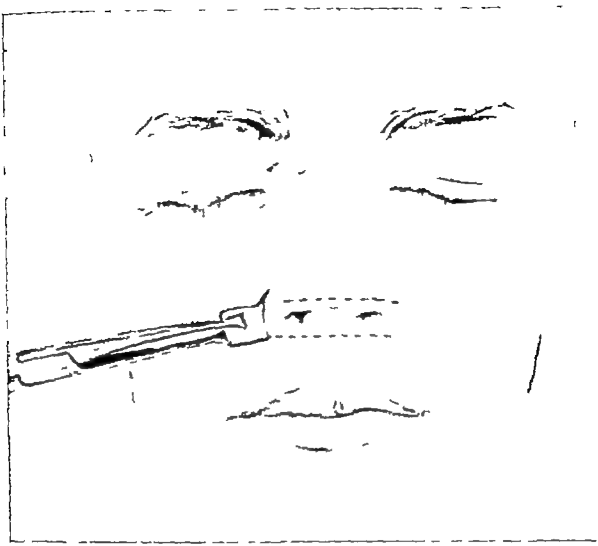


Figure 195 Insertion of crossbar transplant behind lower end of nose useful in correction of some retrusions. Care must be taken to avoid penetration of nasal floors or oral mucosa.

sion Some have a very short columella and in these it may be worth while to do a columellar elongation (Figs. 196 and 197) in the manner outlined in Chapter XVI The amount of intranasal skin may be increased so as to go far up into the nasal floor

In the patients with extensive absence of septal framework replacement may require a large sheet of cartilage or bone usually retaining the L shape so that it may be introduced through a relatively small opening There does not seem to be much advantage in attempting to do this in layers because collapse is almost inevitable

If the nasal tip is wide some camouflaging can be done by converting tip width into height this is done by sectioning the alar cartilages lateral to the domes, and turning the loose ends up back to back to elongate the vertical cruces (Figs. 198 and 199)

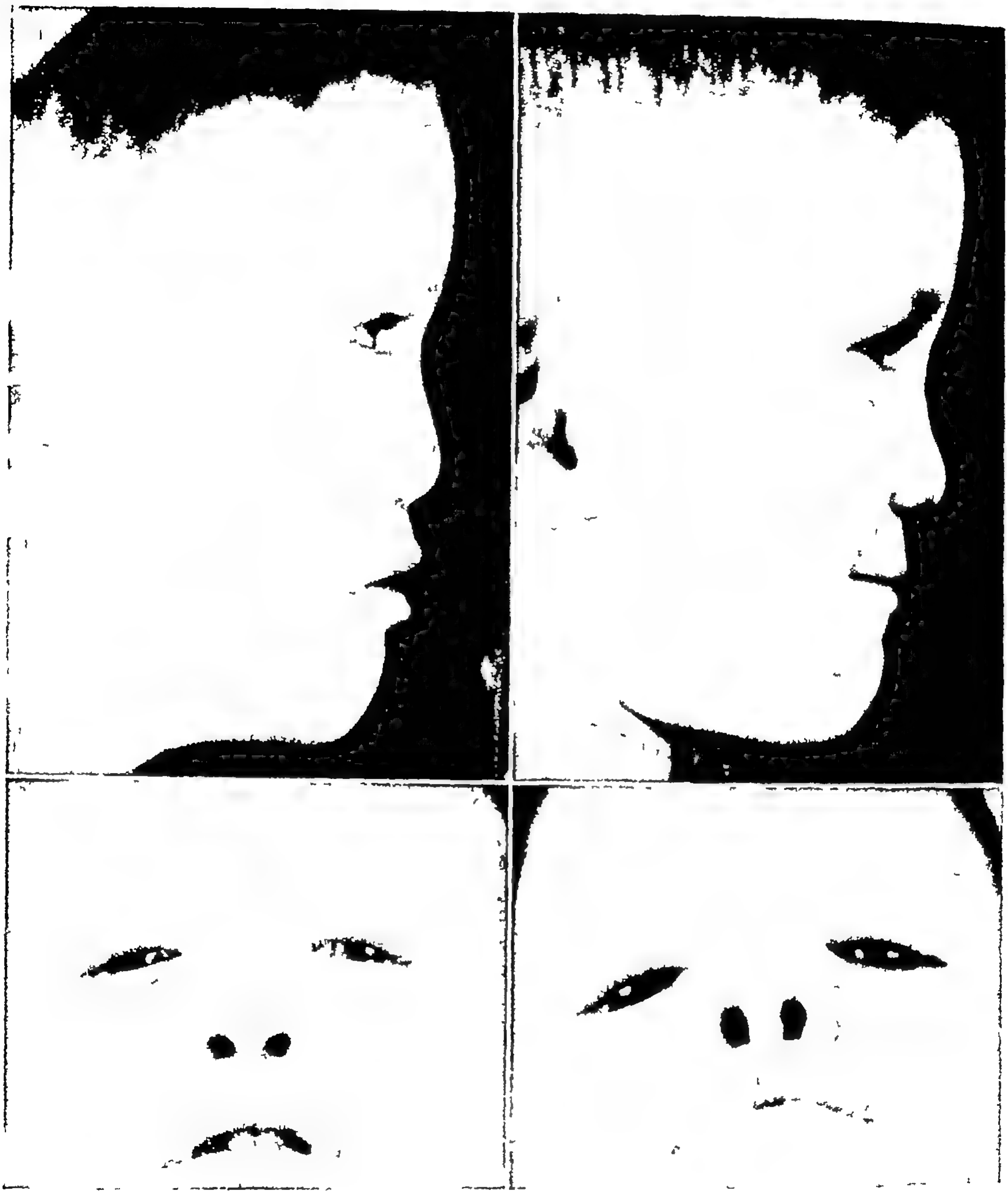


Figure 196 Young child with severe congenital nasal retrusion and very short columella Worth-while improvement from elongation of columella (as described in Chapter XVI) to be followed later by L-shaped cartilage transplant and crossbar transplant if necessary

Figure 198 Mild congenital nasal retrusion corrected without use of transplant Upper lip advanced as described in Chapter XV Mid-section and tip of nose built up by turning forward lateral segments of upper lateral and alar cartilages Nose narrowed

Figure 107 Very severe congenital nasal retrusion almost amounting to absence. Two mucosal layers of septum were dissected apart and a large triangular sheet of bone was inserted for total septal replacement, followed later by elongation of columella and then L-shaped transplant of cartilage.

When the upper lip slants back too much in under the nose, it may be helpful to advance the lip as described in Chapter XXIII, in addition to using the crossbar transplant These procedures are done separately

Although difficult, a worth-while amount of improvement can often be obtained by various combinations of these procedures (Figs 188 and 189) However, much improvement can be obtained just by the single operation of inserting an L-shaped transplant in many of these patients (Figs 182 and 187)

Apparently this deformity does not interfere with the development of the length of the middle third of the face But because this is not certain, it is advisable for these transplants to be done early in life At this time the final size transplant may not be put in because the skin will not stretch far

Figure 199 Front and lower views of same patient as shown in Figure 198

enough for it the largest possible transplant is used and a few years later the final normal size transplant is substituted (Fig 192)

The radical procedure has been recommended of extracting the teeth dissecting the fornix and nose free and putting in a large skin graft with a cavity projected into the columella and then making a full denture with distention of the lip and with prongs going up into the nose This is too formidable and condemns the patient to the wearing of the cumbersome prosthesis The results do not compare in any way with the use of cartilage or bone transplants.

CORRECTION OF THE LUETIC NOSE

It is well known that tertiary or congenital syphilis can give rise to ulcerative processes which destroy the nasal septum and lining and result in a saddle nose though this condition is becoming rare (Fig 200) It is partially because of this stigma however that so many patients with saddle noses from fractures septal abscesses septal resections and other causes are so anxious for repair

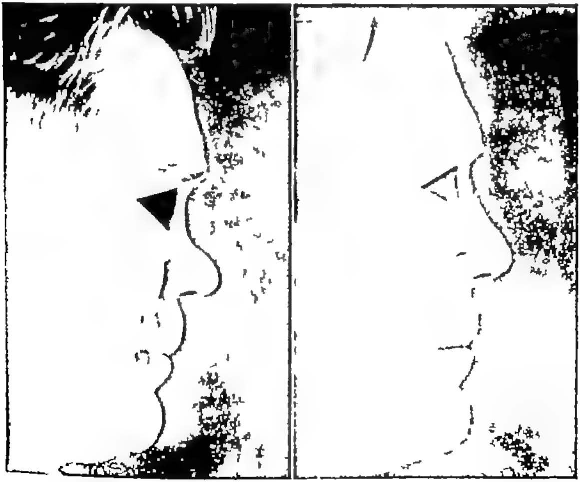


Figure 200. Correction of specific septal loss by single L-shaped transplant of preserved cartilage

Figure 201 Nose collapsed and twisted from specific infection with repair by cartilage transplant

The leutic nose may be differentiated by the history usually by the serology and by the presence of a large septal perforation or total absence of all layers of the septum together with scarring throughout the lining and findings elsewhere such as scarring of the soft palate or nasopharynx Hutchinson s teeth etc.

Surgical treatment is not undertaken of course until any ulcerative process has been healed for at least one year during which the patient has been under treatment It is not necessary however to wait in all cases until the serology is negative

If the nose is not pulled in too badly by dense scarring of the nasal lining it is often possible to obtain a satisfactory correction in just one operation *by insertion of an L shaped cartilage transplant* (Fig 201) Because of the usual large septal perforation the septal segment of this transplant will often have to be smaller than in other cases and occasionally it will be impossible to insert anything other than a dorsal segment put in as a cantilever There can be no cantilever support however unless the bearing point is solid

When the nose is pulled in by dense interior scarring it may be neces

Figure 202. Congenital collapse of nose with marked internal scarring Restoration of lining with split skin graft put in over a mold. Second operation consisted of cantilever cartilage transplant (huge septal perforation extended down to columella)

sary to replace the lining before inserting the framework. This is essential for restoration of the airways, as well as for loosening the nose.

The exact procedure to be used will vary in different patients. In some instances, an incision can be made in the fornix underneath the upper lip, carried through the floor of the nose behind the columella, and by retracting the nose and lip forward (by a double hook in the nostrils), the scar can be dissected completely out of the interior until the nose comes forward and expands to normal size. The raw surface inside the nose can then be covered with a thick split skin graft put in over a dental wax mold, through the mouth incision. This mold is removed in about four days, any excess graft trimmed away, the area cleansed, and the mold reinserted. The mold is then removed, the area cleaned, and the mold reinserted about every two days for a month or six weeks. This restores the lining, but leaves an oral fistula, which must be surgically closed, and a month or two later the cartilage transplant (either an L or dorsal strut) may be put in (Fig. 202).

If a split graft lining does not appear feasible, an arm flap may be put in for lining, either through the mouth incision or by detaching the base of the columella and putting it in through the nose (Fig. 203).

Occasionally patients will be seen with irregular losses and scarring about the nostril borders and columella. This can be repaired with com-

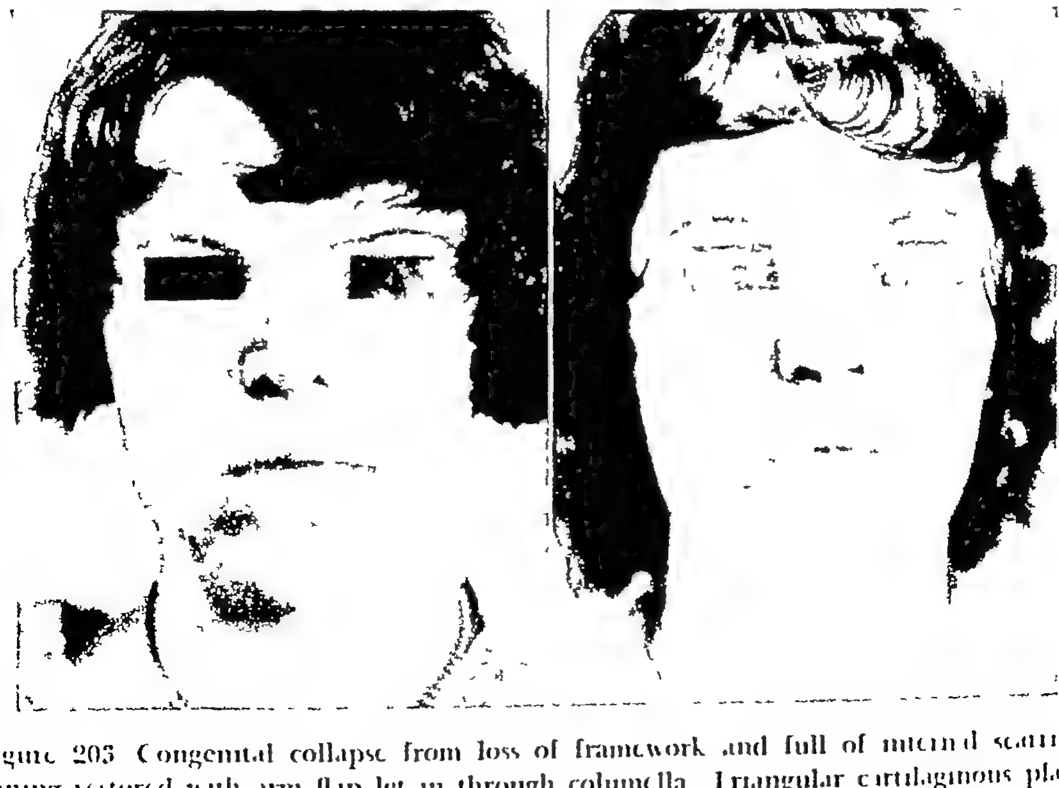


Figure 203. Congenital collapse from loss of framework and full of internal scarring. Lining restored with arm flap let in through columella. Triangular cartilaginous plates inserted in both side walls, and boat shaped dorsal transplant inserted from glabellar region (no septum).

Figure 201 Childhood collapse from pyogenic septal abscess. L-shaped cartilage transplant inserted when patient was six years of age and replaced with a larger one when patient was ten years of age Good growth of middle third of face. Insertion of permanent adult-sized tran plant will be required when patient is about fourteen or fifteen years of age

Figure 205 Childhood septal replacement as in patient in Figure 201 Patient shown at the ages of six, eight, and sixteen years, with excellent growth of middle third of face

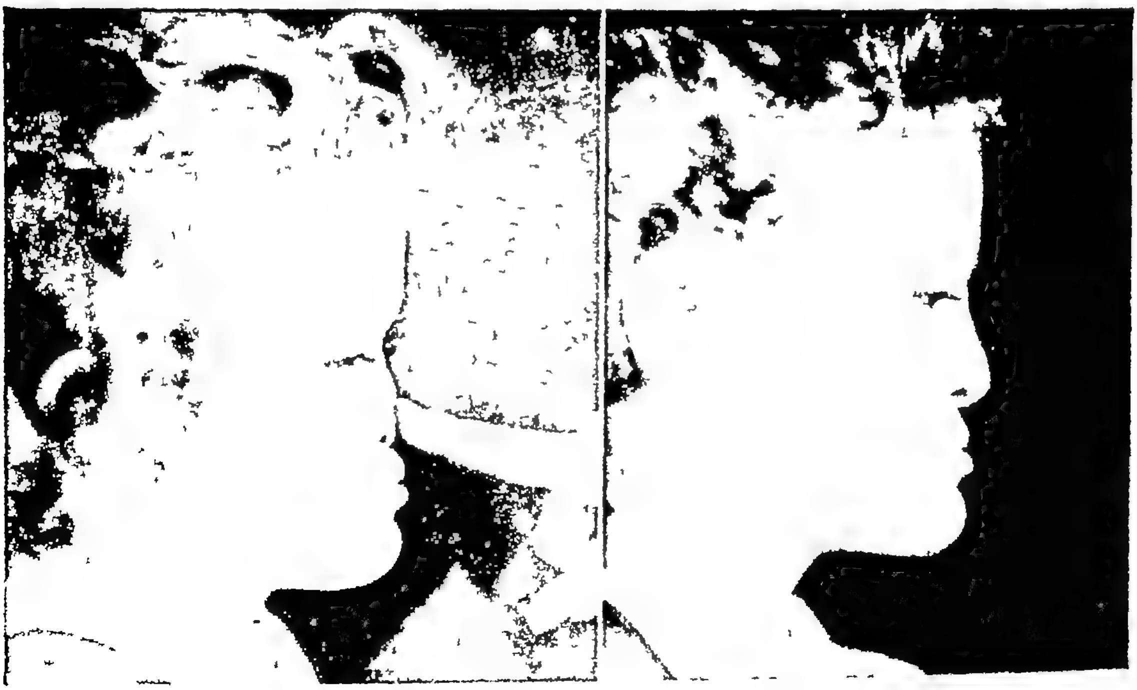


Figure 206 Childhood septal relacement for congenital nasal retrusion This will require replacement at intervals similar to patients in Figures 204 and 205

posite grafts from the ears or with adjacent flaps from the cheeks or lips if the tissue is available

CHILDHOOD REPLACEMENT OF SEPTAL LOSSES FROM ABSCESSES

Pyogenic abscesses may occur in children following fractures severe contusions and hematomas or even spontaneously They commonly destroy enough septal support to result in collapse with a saddle nose (Fig 204)

Growth of the nose seems to be essential for the proper development of the middle third of the face so that if repair is delayed until adult life the patient will commonly have shortening of the whole middle segment of the face as well as the nose This results in the deformity sometimes known as the bulldog face.

A plan has been used in these children which seems to promote normal development of the soft tissues of the nose and the middle third of the face (Figs. 204 to 206) This consists of putting in a larger than normal preserved cartilage transplant. After the child grows a little the transplant looks fairly normal and a few years later it will be too small At this time it should be replaced with another transplant again larger than normal for the size of the nose This process can be repeated at intervals of three or four years until a final transplant can be put in when the child has attained full nasal growth usually at about the age of fifteen or sixteen years (Figs 204 to 206) Usually two stages are sufficient.

Chapter XIII

STRAIGHTENING THE CROOKED OR TWISTED NOSE

LATERAL DEVIATIONS of the nose are often present, either alone or in combination with other deformities They are almost always due to earlier fractures (Fig 207), or accompany clefts of the lip In an untreated fracture of the nose, there may develop such marked bone displacement to one side that the two bony walls are of unequal length from the face to the dorsum

The main difficulty in correction of a deviated nose is not, however, the bony walls, but the cartilaginous and bony septum, the molded distortion of the upper and lower cartilages and their overlying skin that become actual inherent defects on their own part These are as difficult to repair as the bent steel spring of a child's toy or as a warped door made from green lumber

The septum is the framework or "armature" of the nose and as the dorsum of the septum is inclined, so will the nose be bent However, the answer to this problem does not lie in discarding the septum, because regardless of how bent it may be, it is still the support of the nose Many of the secondary operations in these noses are necessitated because of ineffective, primary widespread, septal resections

TREATMENT OF THE CROOKED SEPTUM

Deviation is a mild term for the position of the septum in some of these cases, as it may be bent back and forth and over and under in almost every conceivable direction

If the septum is crumpled by a blow and dislodged from its lower attachment along the floor of the nose, and if the nasal bones are crushed down and remain so, with growth, the worst type of septal, and therefore nasal, deviation results The septum may have so many different planes and deviations that difficulty is experienced in trying to describe them There may be two right angles, the tip may point to one side while the bony nasal spine may be in the opposite nostril In some instances, the nose may have a C shape due to the lower end of the septum carrying the tip in one direction while another opposite bend in the midseptum pushes that part of the nose out in the other direction (Fig 208) At times, that curvature is again doubled, giving an S shape to the nose In addition to these lateral curves and twists, the whole septum may be slumped over to the right or left

After forward blows which shatter the septum, there is usually some depression of the nose with overlapping of the septal fragments These create thick areas or spurs in the septum in which the cartilage is present in two

Figure 207. Osteoplastic straightening of twisted nose six weeks after fracture in a nine-year-old child. Final result shown at right, at sixteen years of age with normal-sized nose remaining straight and airways open. Although widespread removal of the septum may disturb growth in a child's nose this does not mean that a crooked blocked nose should not be straightened in children.

Figure 208. Marked deviation of nose from bent septum. Corrected by moving septum to midline and straightening it, removing hump moving bones to normal position and shortening nose

or three layers side by side There is nearly always some perichondrium or fibrous tissue between the layers so that true cartilaginous union between them is lacking. In such instances, it is sometimes possible to plan the correction so as to leave the most central layer in place for support, and remove the remainder or simply thin the septum This subject is described at some length because of the importance of the septum in the fate of the external nose, whether normal or abnormal

It is of first importance in approaching this problem not to begin by resecting wide areas of the deviated septum To do so may only add to the confusion by allowing the dorsum to sink in and carry with it masses of upper and lower lateral cartilage (Fig 209) Some resecting may have to be done frequently to allow for breathing space where there are spurs and bulges that occlude it, but it is usually best to do any general loosening and straightening first if possible

In cases in which the tip is carried over laterally by a sharp bend in the lower end of the septum, and in which the nose is too long anyway, it is sometimes possible to straighten the tip merely by shortening the nose This involves doing the complete opening incisions, entire undermining of the skin, and shortening the upper lateral cartilages, as well as cutting off the crooked lower end of the septum, and chiseling off any deforming sector of the nasal spine, so that the entire nose is actually shortened When the deformity has been present for many years, some unequal trimming of the lower lateral cartilages will almost always be necessary also to restore the best possible symmetry to the tip (Fig 210)

In the rare instances in which the deflection of the lower end of the septum is at a sharp 90° angle, the bent portion is not contributing to the length of the nose and can be resected without shortening the nose (Figs 211 and 212) Even here, though, it is usually best to undermine some skin and trim any inequalities of the alar cartilages

In any patient in whom length is removed from the lower end of the septum without shortening the entire nose a corresponding amount, the dorsum will cave in above the tip This error happens so frequently, without apparent recognition of its consequences, that it seems worth-while to call attention to it again

Angulations above the lowermost part of the septum, or long gradual curves of the septum, cannot be corrected by the foregoing method In most instances, correction should be obtained by completely mobilizing the deformed sector of the septum and moving it back to the midline It is freed above, often, by removing any accompanying dorsal hump (Fig 45) and cutting any remaining segments of upper lateral cartilage free from it The septum is then loosened from its lower attachments to the maxilla, with or without the bony nasal spine, according to whether the latter has been dis

Figure 209 Crooked nose from old fracture with added difficulty of collapse above tip from too much septal resection. Corrected without transplant by straightening septum switching all available extra cartilage for support in collapsed area hump removal straightening of bones, and unequal trimming of tip cartilages, all in one operation

Figure 210 Bent nose straightened by unequal hump removal, centering of nasal bones, and unequal trimming of upper lateral and lower lateral cartilages

placed The base of the columella is retracted aside, and a tunnel of septal mucosa is elevated, at the junction of the septum with the floor of the nose on either side, using either a Joseph or a septal elevator and going far enough back to get past the deformity A small chisel is then used to cut the septum loose from the upper surface of the hard palate (Fig 213) Following this, the entire septum is then moved back over to the midline, fracturing the perpendicular plate of the ethmoid if necessary A long, thin, septal speculum is most useful for this purpose, inserted back full length at various levels and the blades spread to loosen any remaining attachments Once the entire septum is completely loosened so that it is just held by mucosal attachments, it will stay in the midline as well as any other place, and can be held by internal packing, external splinting, and molding the other nasal structures around it without the necessity of wiring it over, or using any special apparatus (Fig 214)

If there is a sharp angulation in the midsection of the septum, it is freed back that far, and then sectioned from the dorsum to the floor through the angulation (going through the mucosa on one side and the cartilage), the deformed sector is then hinged over to the midline like a gate, swinging on its mucosal attachments There will be some tendency toward recurrence of the deformity as fibrous tissue is formed in the hinge and contracts, but if the rest of the nasal structures are straightened and the nose is splinted straight for a longer time than usual after operation, the nose will probably

Figure 211 A small right-angle bend near the bottom of the septum can sometimes be excised without shortening the nose

remain straight with just the formation of a spur in the hinge area This ter can then be secondarily resected, care being taken to leave at least centimeter of cartilage along the dorsum for support (Fig 215)

In long, gradual curves, the entire septum can be loosened and mo over to the midline as described, but it will still be curved In these instan unequal trimming of the bones, upper laterals and lower laterals, along dorsum of the nose will usually suffice to keep the external nose straight (216) Any bulges into the airways can then be secondarily resected sev weeks or months later, care being taken to leave at least one centimete cartilage beneath the full length of the dorsum, and a one centimeter above the columella, thus assuring an intact L-shaped segment of sept to maintain the height and length of the nose

Figure 212 Example of patient in whom airway was opened and nose straightened procedure shown in Figure 211

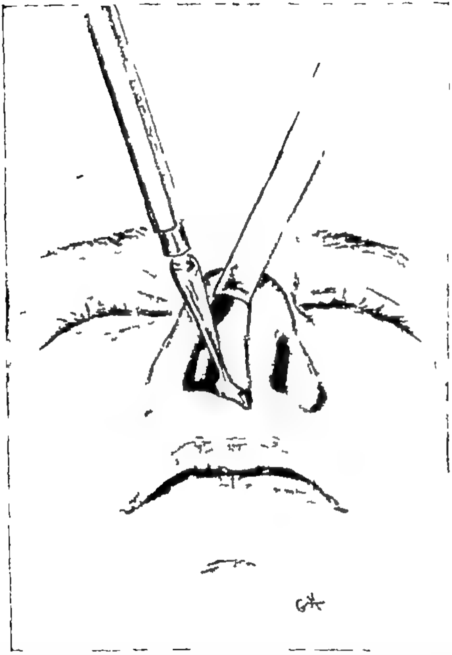


Figure 215 Mobilizing a displaced septum to straighten it and set it back in the midline. After freeing the septum from the nasal bones and upper laterals above and the columella anteriorly the lower edge is chiseled loose from the hard palate as far back as necessary until the whole can be moved as a mobile wall.

Figure 214 Septum mobilized as shown in Figure 213, straightened and moved to midline, without resection

Figure 215 Crooked nose with blocked airways straightened and airways opened as described in text

Figure 216. Displaced nasal spine and lower end of septum chiseled loose and moved to midline. Remainder of nose straightened by unequal trimming of bones and cartilages on the two sides and by shortening.

In some long gradual curves which do not deform the external nose to any great extent the septum can be left in place and the external nose straightened by unequal trimming of the bones upper and lower laterals. In these instances the septal resection can be done at the same operation.

In rare instances a septum will be seen that bends in so many different directions overlaps in so many different places and contains so many bulges and spurs that the only solution is widespread resection (preserving mucosa) and later establishment of support with a preserved rib cartilage transplant. Such noses are usually depressed anyway from lack of any support when the septum is so badly shattered so that a cartilage transplant would be necessary in any event and no extra operation is involved.

TREATMENT OF DEVIATED BONES

Straightening the bones is relatively easy compared to straightening the septal support. In marked displacements of long duration the two sides will

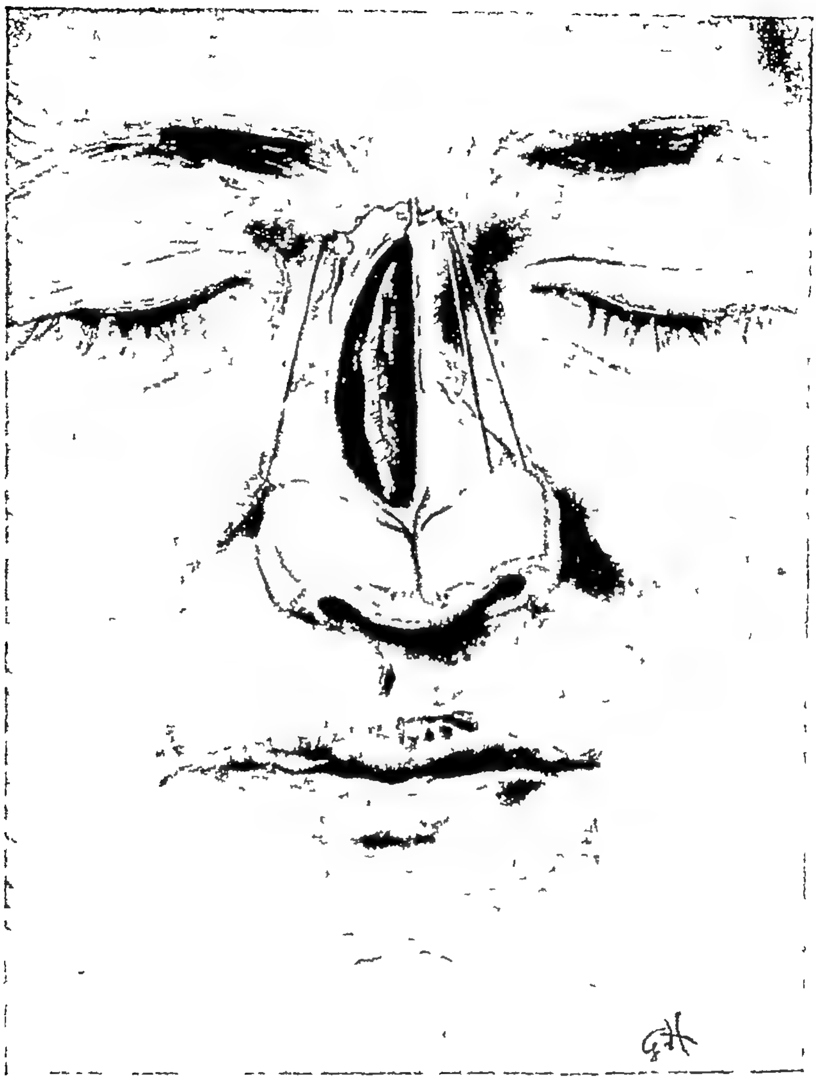


Figure 217 Straightening the deviated nose, which has a long side and a short side, by triangular removal of bone near the frontal process

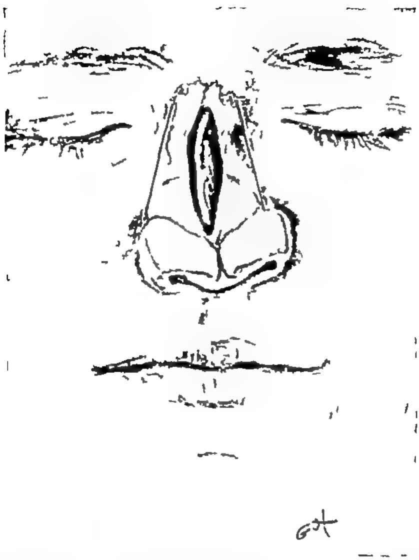


Figure 218 Straightening the deviated nose, which has a long side and a short side, by sawing more hump off one side than off the other This method is usually superior to that shown in Figure 217

Figure 219 Marked deviation corrected by straightening the septum, and unequal hump removal as shown in Figure 218 The nose was also shortened and unequal trimming of upper and lower laterals was done

Figure 220 Osteoplastic straightening of crooked nose.

nearly always be of unequal length from the face to the dorsum. In such instances, it will be necessary to remove more bone from the long side than from the short side. This can be done by sawing out a triangle at the frontal process on the long side (Fig. 217). A tunnel of periosteum is raised over the triangular area with a Joseph elevator, and then with the same elevator a corresponding area of mucosa is separated from the inside of the bone. The two saw cuts are made with the Joseph saw, always making the anterior cut first. The triangle of bone is then removed with a mosquito forceps. If the dorsum of the nose is about the right height, the two nasal bones are cut loose from the septum with a thin chisel (as in Fig. 73), the opposite frontal process is sawed through flush with the face, the septum is straightened, and the nasal bones are then fractured over medially together, to form a straight dorsum in the midline.

When the deviation is accompanied by a hump, this procedure can be used together with hump removal evenly across the dorsum (Fig. 217). However, it is usually simpler and better to saw off more hump on the long side than on the short side (Fig. 218), leaving an equal amount of bone on the two sides. The nose can then be narrowed in the usual manner without the necessity of excision of a separate triangle of bone at the frontal process. This unequal hump removal method is recommended (Fig. 219).

It has been observed that hypertrophy of the deflected lower part of the septum may occur, as in Figures 212 to 216, so that it is grossly larger than normal and its prominent bulging into one of the nostrils may be due to this enlargement as well as to deflection from injury. This may be the reason for the development of deformity several years after injury in many patients.

If this lower border is bent clear around at an acute angle so that the lower edge protrudes into the nostril, resection may be required, as permanent straightening of it might be compared to trying to straighten a warped door or bent steel spring. Care is taken not to allow the tip to drop, however, as it is better to have some deviation at the tip than depression of it. If there is too much distortion, resection and a dorsal transplant may be indicated. The transplant has been necessary secondarily in many patients seen following wide resection for establishment of airways.

Chapter XIV

EARLY TREATMENT OF FRACTURES AND OTHER ACUTE INJURIES*

DISPLACEMENT OF THE nasal bones are best replaced as soon as practicable after the injury If there is a wait until swelling has subsided partial consolidation will have taken place and the best opportunity for repair will have been missed However this does not mean that all fractures should be reduced at the place of the accident in emergency rooms or under other haphazard circumstances The surgeon should have the advantages of a well equipped operating room a good light suction apparatus and adequate assistance for reducing severe fractures short delays will probably compromise the final result less than trying to work without these essentials The bones can usually be moved without chiseling up to a week or ten days after the accident the longer the elapsed time the more force will be required

The nasal bones and cartilages are covered on the outside with a thin subcutanous layer and skin and on the inside with a thin submucous layer and mucosa. When an external blow produces torn mucosa and internal bleeding, that is fairly reliable evidence that the bones or cartilages must have been displaced.

X ray pictures are usually not of much help except in detecting chip fractures of the lower dorsum of the bones these are best shown on a dental film held alongside the nose and exposed laterally by soft tissue technique (Fig 221) Posteroanterior x ray pictures of the face (in Water s position without the cone) are of considerable help in delineating associated injuries of the facial bones

Nasal injuries per se are best evaluated by clinical examination The vibrassae may be trimmed out of the nostrils if necessary and any bleeding checked by packing the nose for a few minutes with weak adrenalin on gauze and by external allover pressure with a gauze pad The nasal bones and external cartilages are then lightly palpated through the overlying skin any irregularities or areas of point tenderness being noted The history of the shape of the nose preceding the accident may be of help in evaluating the findings

The mucosa is then swabbed with a topical anesthetic containing a few drops of adrenalin The interior of the nose is carefully inspected through a speculum with a good light and the torn mucosa that is the source of the

* Cf Brown J B. and McDowell F Care of severe injuries of face and jaws, *Journal Lancet* 60:260 1940

Brown, J B Fractures of the bones of the face *Surg Gynec & Obst.*, 68:564 1939

bleeding is located If the tear in the mucosa is under the bones, the patient must have had a fracture, if it is at the junction of the nasal bone with the upper lateral cartilage, or at the junction of the upper and lower laterals, it would indicate that a sudden cartilaginous displacement has taken place The cartilages often spring back into position spontaneously, but this point must be checked in each instance Tears in the septal mucosa, or hematoma under it, indicate septal fractures A loose, tender, nasal spine may be missed unless it is specifically looked for

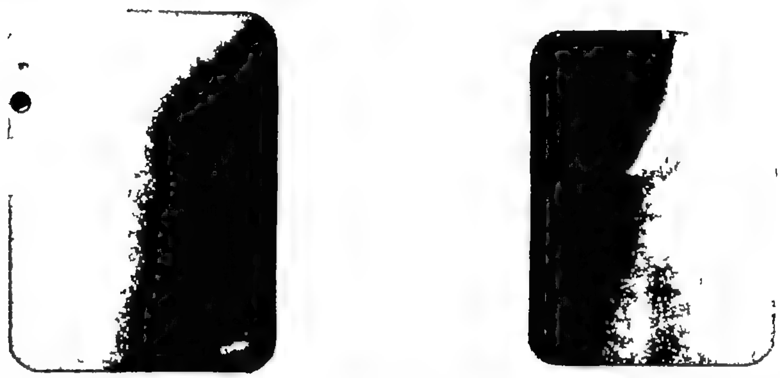


Figure 221 X-ray pictures of fractured noses made by holding dental films against side of the nose and exposing them laterally with a soft tissue technique

The two types of fractures usually encountered are the squashing fracture from a frontal blow (Fig 222), and the laterally displaced fracture from a side blow (Fig 223) The former type may be associated with a good deal of comminution, spreading apart of the bases of the nasal bones, and overlapping of the septal fragments At times, the nasal structures act as a chisel to split open and spread apart the inner canthi and adjacent facial bones The lateral fracture may consist of just one nasal bone broken inward, but more commonly consists of a triple break of both bones and the septum with the entire nasal mass displaced laterally Any of these fractures may be associated with blockage of the airways by pieces of bone, cartilage, and mucosa

Block anesthesia is used in adults, as for an osteoplastic operation Blocking the nasoethmoidal nerve along the medial wall of the orbit is not recommended because it may cause large orbital hematomas A short general anesthetic is almost always necessary in children

Various elevators can be used, but a Kelly forceps, with each blade covered with a piece of rubber tubing, is as satisfactory as any other Before introducing the forceps, the inside of the nose is examined visually and any torn flaps of mucosa tucked back in place The elevator is then introduced through the vestibule and up under the bones, the bony fragments are elevated directly forward, swung over into the midline, and then molded into

Figure 222. "Squashed in" fracture from a frontal blow (automobile dashboard) Fractured bones elevated bases moved in and held by aluminum splint.

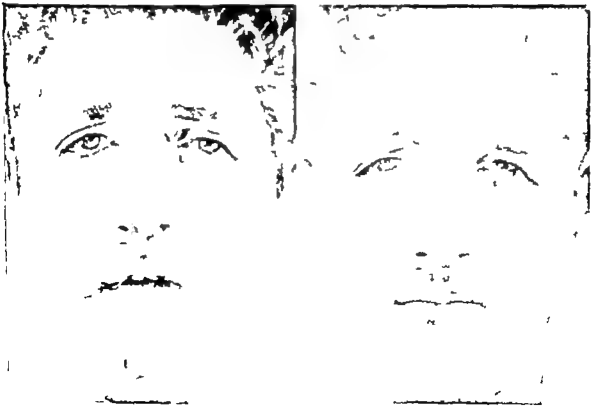


Figure 223 Deviated fracture from a lateral blow Nose moved back to midline and held with aluminum splint.

position with the fingers A long septal speculum is then introduced thr
the airway completely back to the choana on either side, and the op
gently re-established Any completely detached chips of bone or car
from the septum may be removed, but all other are tucked back into
along with any loose flaps of mucosa Plain gauze packing is inserted
throughout the length of the airway, and then up under the bones, it sh
not be tight or distend the nose, but enough is used to hold any mu
flaps in place and to help check any bleeding

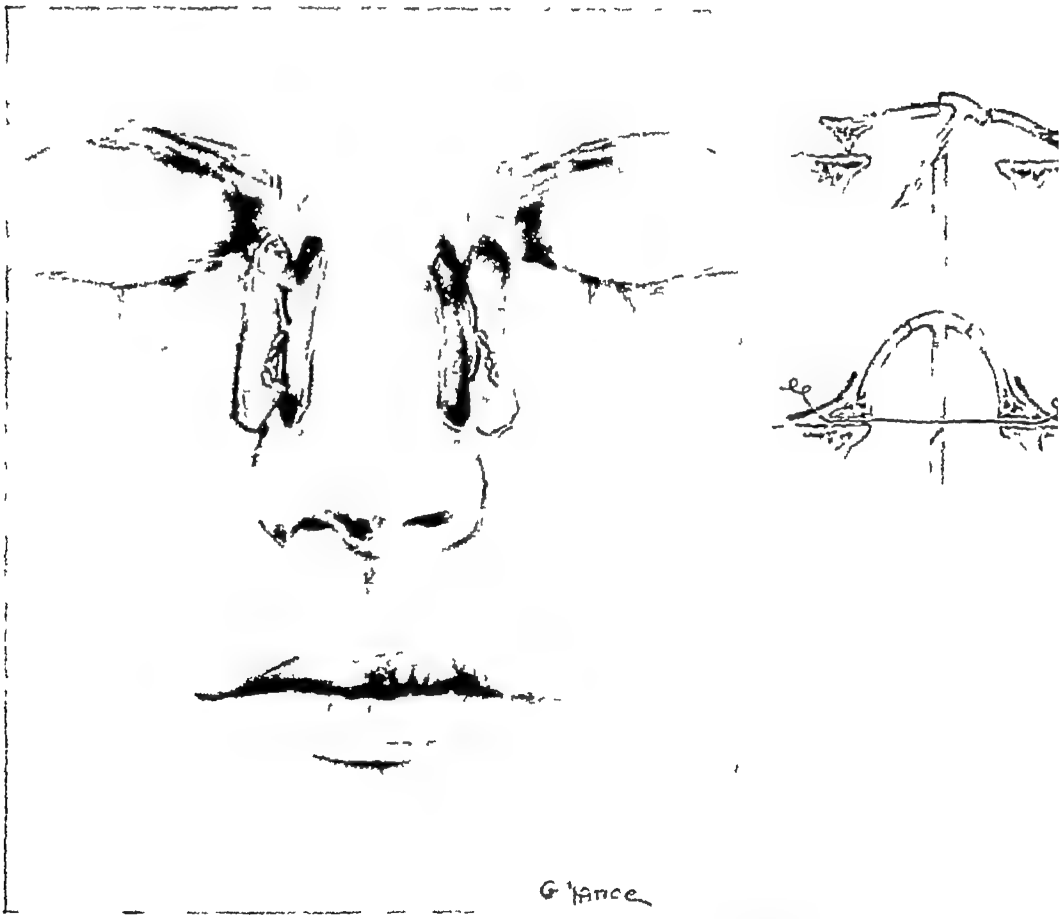


Figure 224 Application of through-and-through wires behind the nose, tied ove
plates, to hold the lateral walls inward and the dorsum forward

The laterally displaced fractures are easy to immobilize, as they hav
recurrent tendency to displace after they are reduced; the external alumi
splint used for osteoplastic dressings is used for protection

The frontal "squashed" fractures are more difficult to hold in place
ordinarily can be satisfactorily held with the same aluminum splint u
the septal support is badly shattered, when there may be a tendency fo
septal fragments to sink in and overlap, carrying the nasal bones with t

This can be prevented by putting a through and through wire sling between the nose and the face to hold the nose out forward (Figs 224 to 227)

Figure 225 Patient with through-and through wire fixation

Two pieces of No 24 stainless steel wire threaded on large slightly curved surgeon s cutting needles are used The needle and lower wire are passed through the lateral fracture line (in the frontal process), through the cartilaginous septum and then out through the other lateral fracture line—all while an assistant holds the nose forward with an elevator The upper wire is passed through in the same manner except that it goes through the bony part of the septum and more difficulty will be experienced at this point, but the bony plate is thin and with patience it can be accomplished The wires are then twisted together externally over lead plates on either side the ends cut short and bent in smoothly against the plates Small adhesive strips are inserted under the edges of the plates to prevent irritation of the underlying skin The standard external aluminum splint is then applied over the nose and plates and molded into shape

Figure 226 Multiple compound injuries of both jaws and nose, with inner canthi driven apart Nasal bones held in with through-and-through wire fixation, plus external aluminum splint

Figure 227 Fractured nose and upper jaw Jaw held with Kirschner wires Nose held out in front of face by through-and-through wire fixation behind it

The splint is changed every few days and the total period of immobilization is about ten to fourteen days Careful application of these sheet aluminum splints and maintenance of the proper shape of the nose is one of the secrets of success. *These splints will hold fractures in place as well as noses after osteoplastics which are obviously about as severely fractured as any nose.*

Various other types of immobilization have been described in the past and require some comment. Splints which are anchored to the scalp either by plaster headcaps or head mirror bands are askew most of the time and require constant readjustments. If it were possible to secure the splint to the scalp one could not keep the scalp from moving on the skull

Splints anchored to the teeth require revisions and fitting which may waste hours or days of valuable time during which the nose could have been held in place by a more simple procedure Many patients will be edentulous in the wrong places others will have key teeth loosened or broken in the same accident in which the nose was injured others will sustain dental damage from the application of the splints.

Splints which have prongs going up in the nostrils and pushing forward on the back surfaces of the nasal bones by any considerable constant pressure on the mucosa will blanch out the blood supply in this local area and may cause necrosis of the mucosa or even of the bones If this amount of pressure is not necessary the prongs probably are not necessary either and the nose can be held by more simple means

Plaster of Paris splints are bulky and heavy so that they tend to depress fractured noses Dental compound is lighter but is very tricky in its application as it must be molded in exactly the right shape at the instant it hardens and cannot then be changed

Some of the complicated manufactured splints of stainless steel may work but require many adjustments are expensive and may not be at hand when needed. The simple sheet-aluminum splints are easy to use can be molded until one is satisfied with them are cheap and are adequate for fixation after most nasal operations and fractures.

Fractured noses are said to be more common than any other fractures except those of the clavicle and wrist It seems certain that they are the most inadequately treated fractures this may be due to failure of teaching their care to medical students and house officers or to the advice in some surgical textbooks just to pack them full of greased gauze and apparently hope that they will come out all right. Possibly a contributing factor is the multiplicity of complicated splints which have been advocated so that the neophyte is likely to think that he cannot do anything if he does not have one of these contrivances at hand Actually many lateral fractures would heal in fairly good position if they were pushed back over into the midline with the

thumb Any serious effort to replace the bones in their normal position and to hold them there with a simple splint is better than just negating the fracture and allowing it to heal as it will By following the instructions in reduction and splinting in this chapter, routine good results should be obtained Some very severe fractures will inevitably require some secondary work, however (Fig 228)

Figure 228 Severe compound, comminuted, nasal injury (few sutures put in at first-aid station) Center picture shows result of initial repair, using all viable tissue present Right photograph shows final result of secondary cartilage transplant Patient had associated fracture of orbital floor and blindness in one eye from intraocular hemorrhage

A key point to remember is that the nasal bones cannot be held forward by internal packing, the more packing that is inserted, the farther back in the throat it will go

CHILDHOOD FRACTURES

These fractures assume great importance because they are often missed and with the elements of the nose left out of position deformity progresses with growth If a child is struck over the bony part of the nose and bleeds from the inside there has been a fracture—the bleeding occurring because the edge of a bone has cut through the mucosa This separation may not necessarily be of bone itself but may be from a separation of a cartilage from a bone or from excessive crumpling of the septum If the blow has come from the front the bony tip may be depressed and should be simply elevated with a rubber-covered forceps. On the outside the fingers may help in the molding and often a distinct click may be heard or felt as the fragments slip into place After the fragments are elevated and aligned simple packing for twenty four hours and external splinting for ten days usually suffice

Operative manipulation is not advocated for every child who is hit on the nose but is sometimes the only way of reaching a positive diagnosis. After careful evaluation it is felt that errors on the side of a simple forceful elevation of the dorsum and any outside necessary molding will produce less unfortunate results later than will waiting until the swelling is down to see if there is a fracture

The chip fractures of the nasal bones apparently press the septum down resulting in twisting with growth and even with apparent stimulus to over growth These tiny chips may never heal back to the bones in childhood or adults but they should be lifted up and the septum given a chance to develop normally In spite of precautions and elevation secondary deformities may occur

CONTUSIONS AND HEMATOMAS OF THE NOSE

Occasionally patients will be seen with massive swelling over the nose shortly after a blow but with no bleeding from the inside. Some of this swelling is edema but the greater part may be due to a fresh hematoma from rupture of a subcutaneous vessel

Care must be exercised in differentiating these from fractures which are much more common The fresh blood can often be evacuated through a large needle after which better palpation of the nasal bones and cartilages is possible The immediate application of pressure with an external aluminum splint (left on for a few days) will usually prevent recurrence of the hematoma

LACERATIONS OF THE NOSE

Acute external injuries of the soft parts cannot be separated from the discussion of fractures because the two occur together so frequently Dé

Figure 229 Traumatic "chiseling open" of nose with result of initial repair, including replacement of canthi

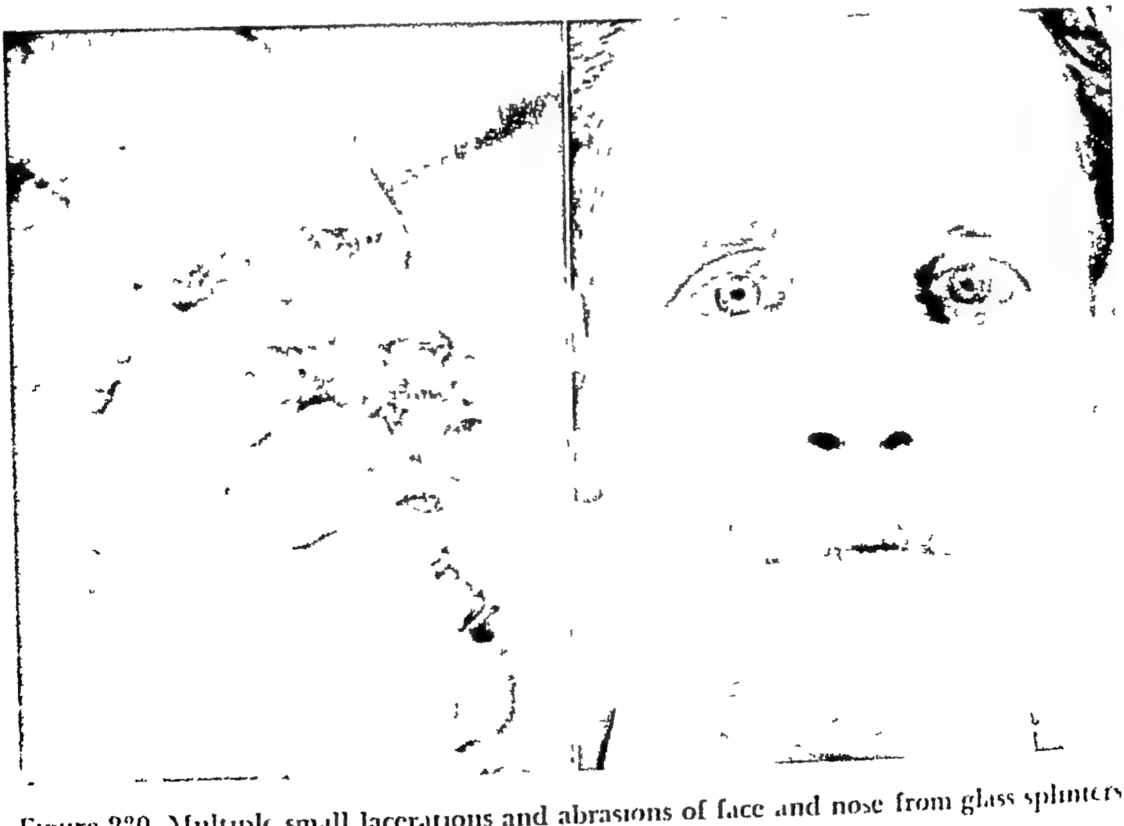


Figure 230 Multiple small lacerations and abrasions of face and nose from glass splinters Result of careful initial repair as outlined in text.

bridement is done with soap water, and ether if necessary and all street dirt and oil scrubbed out with a brush if necessary

No sacrifice of tissue is made in the usual sense of débridement of cutting away ragged, uneven edges. Only tissue that is known to be dead is removed and the most careful approximation of edges is done beginning at known points such as the nostril border or columella and trying to get lining bone cartilage and skin all back in place as accurately as possible (Fig 229)

In through-and through lacerations interrupted sutures of fine catgut may be used for the lining (with the knots tied on the inside) interrupted 000 white silk for the perichondrium or periosteum the same subcutaneously if a thick enough layer is present to accommodate them and interrupted sutures of the finest black silk in the skin put in just at the margins of the skin to avoid ladder marks. Subcutaneous sutures are avoided in areas in certain noses where there are large pores full of sebaceous material as tiny abscesses may form around each one this type of suture however is quite valuable for approximation in all other instances (Figs 230 231 and 233)

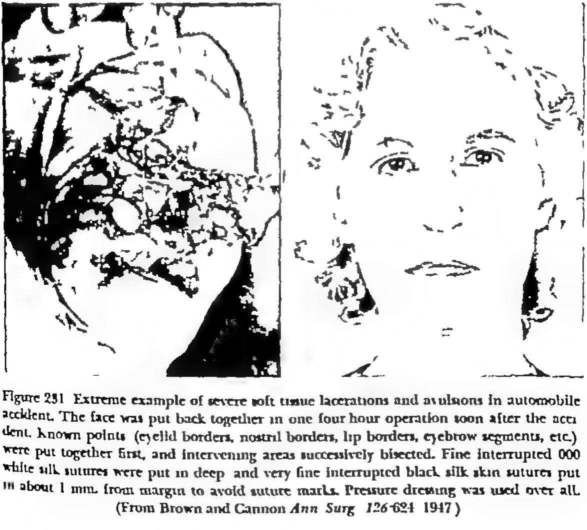


Figure 231 Extreme example of severe soft tissue lacerations and avulsions in automobile accident. The face was put back together in one four hour operation soon after the accident. Known points (eyelid borders, nostril borders, lip borders, eyebrow segments, etc.) were put together first, and intervening areas successively bisected. Fine interrupted 000 white silk sutures were put in deep and very fine interrupted black silk skin sutures put in about 1 mm. from margin to avoid suture marks. Pressure dressing was used over all. (From Brown and Cannon *Ann Surg* *126*:624 1947)

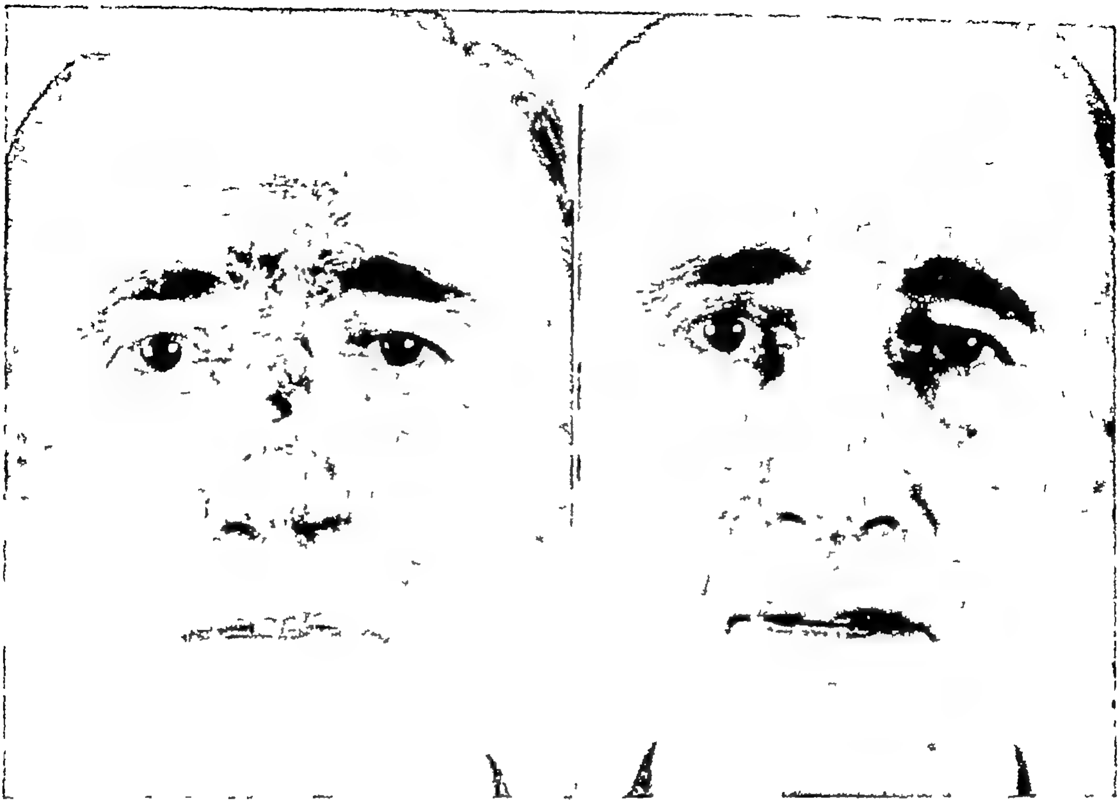


Figure 232 A few chip fractures, but severe abrasions of the nose with oil and grease Dirt scrubbed out with soap and water, ether and benzene Fractures reduced Nose covered with fine mesh grease gauze, thin pad of plain gauze, and forehead type of aluminum nasal splint (Figure 161) applied over all

Figure ... it loose as ... dshield and saved by immediate pressure
d ... l with m ... ures and result shown four days later.

The skin sutures are covered with a sliver of fine mesh grease gauze then sterile adhesive strips and an external aluminum splint, together with careful internal gauze packing This supportive pressure dressing to keep down edema and prevent hematomas induces smooth healing It is interesting to note that the first use of pressure in surgical dressings was found recorded in Egyptian hieroglyphics in discussing nose injuries (*The Edwin Smith Surgical Papyrus*)

ABRASIONS AND DIRT TATTOOS

Abrasions from street injuries are very likely to contain dirt or oil It is essential to get all of this dirt and oil out by washing the wound with soap and water using a brush if necessary Ether may be helpful at times in getting oily substances out. Any small areas of pigment deeply ground in can usually be cleaned out with a small chalazion curette Pressure for a few minutes with gauze soaked in weak adrenalin will stop any bleeding The area is then covered with fine mesh grease gauze then plain gauze and an external aluminum splint may be placed over all and strapped to the cheeks (Fig 232)

SEPTAL FRACTURES AND DISLOCATIONS

Most severe septal fractures are associated with a frontal squashed fracture of the nasal bones and the treatment is as outlined in this chapter

Fractures and dislocations of the septum and of the nasal spine can be produced however by an upward blow on the bottom of the nose There is usually some swelling discoloration and tenderness around the nasal spine area and the displaced septum may carry the tip of the nose to one side or the other On inside inspection there may be tears in or hematomas under the septal mucosa as well as displacement of the septum

Treatment is rather simple as there are no muscles or other forces acting on the septum and a loose septum tends to stay wherever it is put The airways are cleaned out with suction and a nasal speculum and the septum and tip of the nose are moved back to the midline Any hematomas of the septum are opened and drained and the nasal spine is carefully replaced The nose is then held in position with internal packing and an external aluminum splint.

If there is a tendency for the spine to remain displaced upward (creating an acute angle between the columella and lip) some measures may be taken to hold it down This may be done by making an incision over it for exposure and suturing the periosteum down to the periosteum of the maxilla or by using a catgut suture encompassing the spine and anchored to the periosteum below As times one may want to encompass the spine with a fine wire suture bringing it down underneath the upper lip and anchoring it to the incisor teeth

Dislocations of the nasal septum are occasionally seen in newborn babies If there is some discoloration of the mucosa, it may be due to birth trauma (from face presentation, etc) and it is worth-while to force the septum and the tip of the nose back into place No dressing is necessary, but the baby may be examined daily for a short time and manipulation done again if necessary More rarely one will be seen with no discoloration of the mucosa or other evidence of recent trauma In these, the tip of the nose may be forced into over-correction, only to resume its former shape within a few minutes It is probable that the position of the tip of the nose is developmental in some of these, possibly influenced by intrauterine position or other factors They often improve a good deal spontaneously within a few months, but it is thought that the initial attempts at correction are not harmful The possibility of later secondary work should be considered from the beginning

COMPOUND INJURIES ASSOCIATED WITH NASAL FRACTURES

Depressed fracture of an orbital floor is one of the most common associated injuries in severe nasal fractures, and an examination for it should be made in each instance The fracture can usually be felt by careful palpation around the orbital rim, and can be shown on posteroanterior x-ray pictures (in Water's position) The ecchymosis around the lids may be little more than that associated with nasal fractures alone Early diplopia is uncommon because the edema in the orbit tends to hold the globe up and forward temporarily It is, however, exceedingly important to reduce these fractures early, otherwise the subsidence of the edema may allow the globe to sink back and downward and may result in considerable diplopia

Examination of the eye is indicated in each instance, as the same blow that fractured the nose and orbital rim may have compressed the globe enough to produce intraocular injuries (Fig 228) The orbital floor fracture is elevated by lifting up the upper lip, incising over the canine fossa, entering the antrum and evacuating it, prying the orbital floor up into position, and packing the antrum full of iodoform gauze to support the floor for ten days to two weeks

Separation of the canthi may accompany severe frontal or pyramidal fractures in which the broken nasal bones chisel the face apart (Fig 226) These must be replaced early, as late attempts at replacement are only occasionally successful When due to fractures of the lacrimal bones, they can often be held in place by the wire sling over lead plates technique outlined earlier in this chapter If the fragment of lacrimal bone attached to the internal canthal ligament is tiny, it may be necessary to encompass it with a wire loop put right through the caruncle, carrying the two wire ends through the fractured nose and anchoring them over a lead plate on the opposite side of the nose

If the canthi are separated and the nose is crushed down then the nose literally has to be dragged up out of the face with the elevator as described With the thumb and finger at the same time the canthal regions are brought together and this maneuver may give canthal replacement that could never be obtained by any operation if it were allowed to become fixed out of position

Lacrimal apparatus damage occurs in complicated fractures in this area and blockage of the duct may result Here again as in the canthal region replacement early elevation and fixation of the parts will result in the fewest possible blocked ducts

Fractures of the upper jaw and hard palate are likely to be driven upward and backward so as to impinge on the nasal floors and airways A long septal speculum put through the inferior meatus and twisted and spread open may help to push these jaw fragments back down into place At times the surgeon s little finger introduced through the nostril and on back through the airway is an effective method combined with manipulation by the other hand on the oral side of the palate The upper jaw fragments are usually held in place by interdental wiring or by internal fixation with a Kirschner wire (Fig 227)

Fractures of the frontal sinus occasionally accompany severe nasal fractures If rhinorrhea is present neurosurgical assistance is obtained often it is decided best to proceed with reduction of all fractures but to avoid packing the nose and to keep the patient on maximum doses of antibiotics for a time In the absence of rhinorrhea, nothing special is necessary for the frontal sinus unless there is some displacement of the bones In this instance the fractures are reduced and the sinus is often drained by making a window through the floor into the nasal cavity placing a rubber tube drain from the sinus to the nostril opening This rubber tube can be sutured to the membranous septum to keep it from slipping out but should not be sutured to the columella where the sutures might leave visible scars

In compound facial injuries in which there is a cerebrospinal fluid leak from the ethmoids early restoration is still indicated with care being taken not to do irrigations or other manipulations which might provoke contamination *The recommendation that this rhinorrhea be allowed to flow until it stops before repair is begun on faces and noses is likely to lose the best possible time for replacement and not accomplish anything for the fractured ethmoid region or avoid any danger*

SECTION 4

CORRECTION OF CLEFT LIP NASAL DEFORMITIES

Chapter XV

SECONDARY REPAIRS OF NOSES ASSOCIATED WITH SINGLE CLEFT LIPS

THE APPEARANCE of the nose is important in patients with cleft lips and should receive close attention in both the primary and secondary repairs* (Fig 234) Unfortunately this fact has not been fully realized so that many patients requiring secondary repairs have even more deformity of the nose than of the lip (Figs. 235 and 236) All of the procedures used in other osteoplastic repairs and some specific procedures may be needed in various patients with these deformities The same careful preliminary study is necessary as for other nasal deformities and a plaster cast may be valuable

In single clefts the deformities are (1) drooped slumped retruded nostril on the cleft side (2) inadequate rotation of nostril base (3) deficiencies or excess of nostril floor (4) nostril base higher or lower than on the normal side (5) slanting deviation of entire nose toward normal side (6) tip of nose hooked down over upper lip (7) blockage of one or both airways (8) humps large noses, saddle deformities, retrusions and all other deformities also seen in patients without clefts It is particularly worth while to repair nasal deformities in these patients as they have enough handicaps to bear without these additional ones

PRIMARY CORRECTION OF DEFORMITIES OF THE NOSTRIL BASE AND FLOOR

In newborn babies with total single clefts the columella slants markedly toward the normal side and the ala on the cleft side extends as a straight linear structure from the nasal tip toward the lobe of the ear until it disappears in the cheek. In the primary repair a plan is used which rotates the straight ala up into a tube with the base pointing toward the columella rather than back into the face The plan also provides for straightening the columella and symmetry of the nostril floors and bases. This requires undermining and mobilization of the lower part of the nose and much of the cheek on the cleft side The following small triangular flap design has been of value in obtaining acceptable primary repairs of the nose and lip and features of it are keypoints in secondary repairs (Fig 237)

The first move is to push the normal side of the lip over into the cleft until the columella is straight With the lip held in this position a line is conceived crossing underneath the nose at the level of the base of the col

* Cf Brown J B., and McDowell F., Secondary repair of cleft lips and their nasal deformities *Ann Surg.*, *114* 101 1941

umella At the point where this line crosses the mucocutaneous junction in the cleft floor, point *A* is marked using a fine pen and 5 per cent alcoholic methylene blue The skin between point *A* and the base of the columella is to be most of the nostril floor, and should correspond in width to the floor on the normal side if possible With the lip still in this position, point *X* is marked in the normal floor in the same relation to the columella as point *A*, this will nearly always be at the inner border of the tip of the nostril base

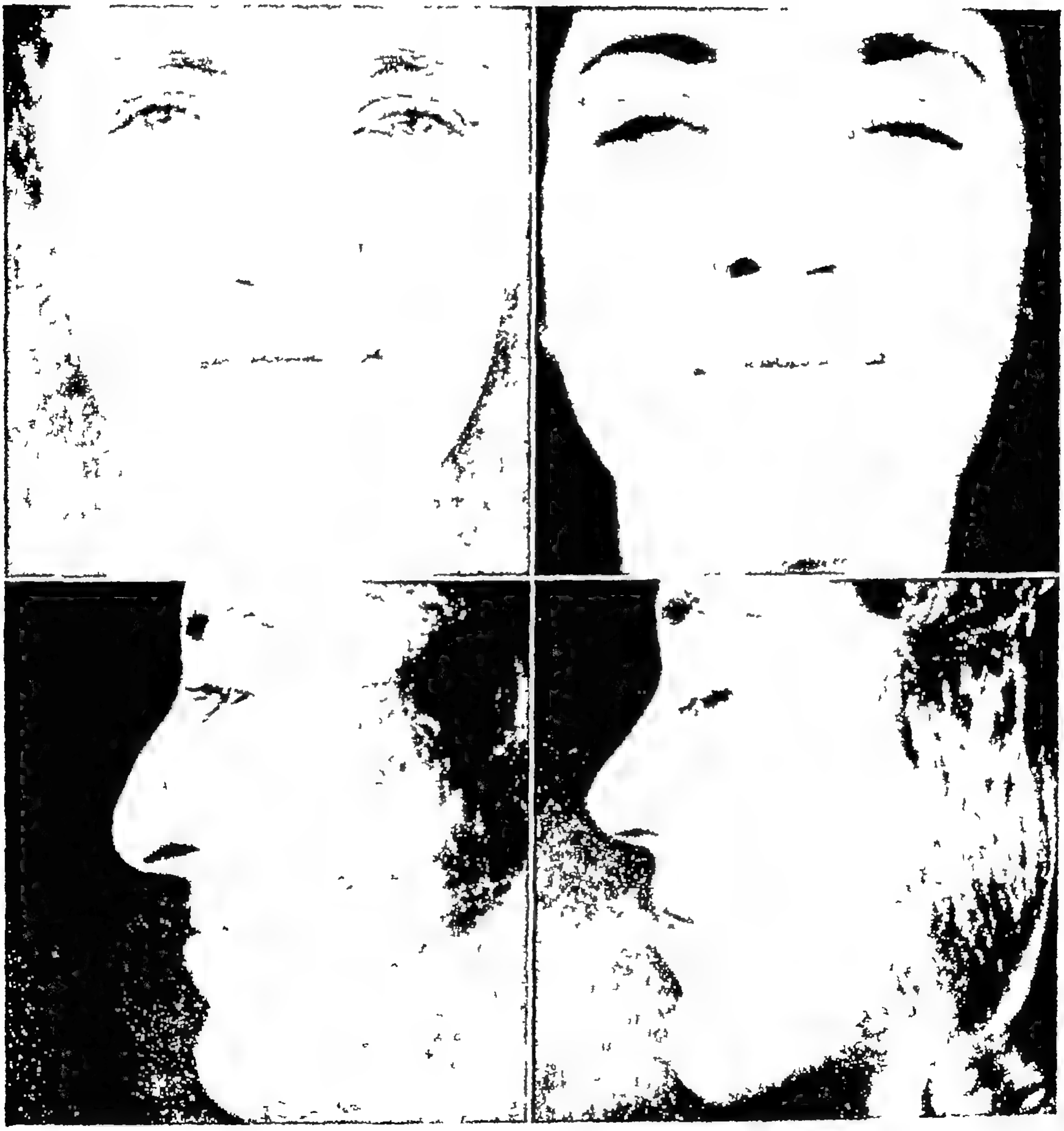
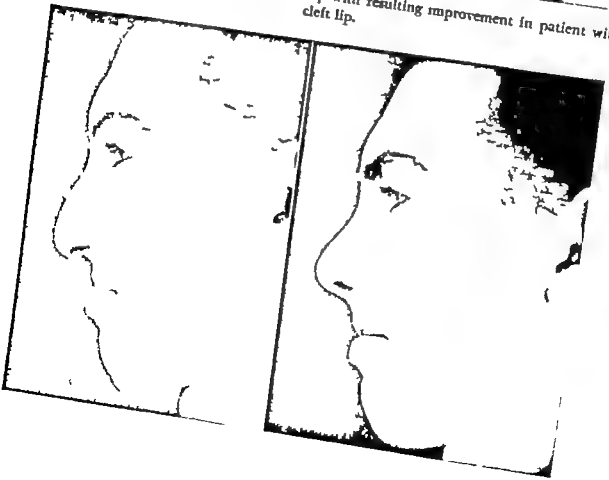


Figure 235 Example of residual cleft lip deformity in which the nose presented greatest possibility of improvement

Figure 236 Nasal correction more important than lip correction, although latter was advanced at same time

Figure 235 Correction of huge nasal droop with resulting improvement in patient with cleft lip.



Point A' is then marked on the cleft side in exactly the same relation to the nostril base that point X bears to the normal nostril base It can thus be seen that future approximation of A to A' should put the two nostril bases on the same level, pointing in the same direction, with the same amount of nostril floor between each one of them and the columella

Following this, points B, B', C, and C' are then marked out on the two sides of the lip in a manner to provide for the most symmetrical lip repair. The lip, cheek, and nostril base on the cleft side, and the lip, columella, and nostril base on the normal side are undermined through incisions underneath the lip until the two sides can be approximated easily All tissue on the cleft sides of the marks is then either excised or turned aside as flaps, and the corresponding marks on the two sides of the lip are united This latter maneuver rotates the flat nostril into a tube with the base in a symmetrical position and pointing toward the columella, and straightens the slanting columella

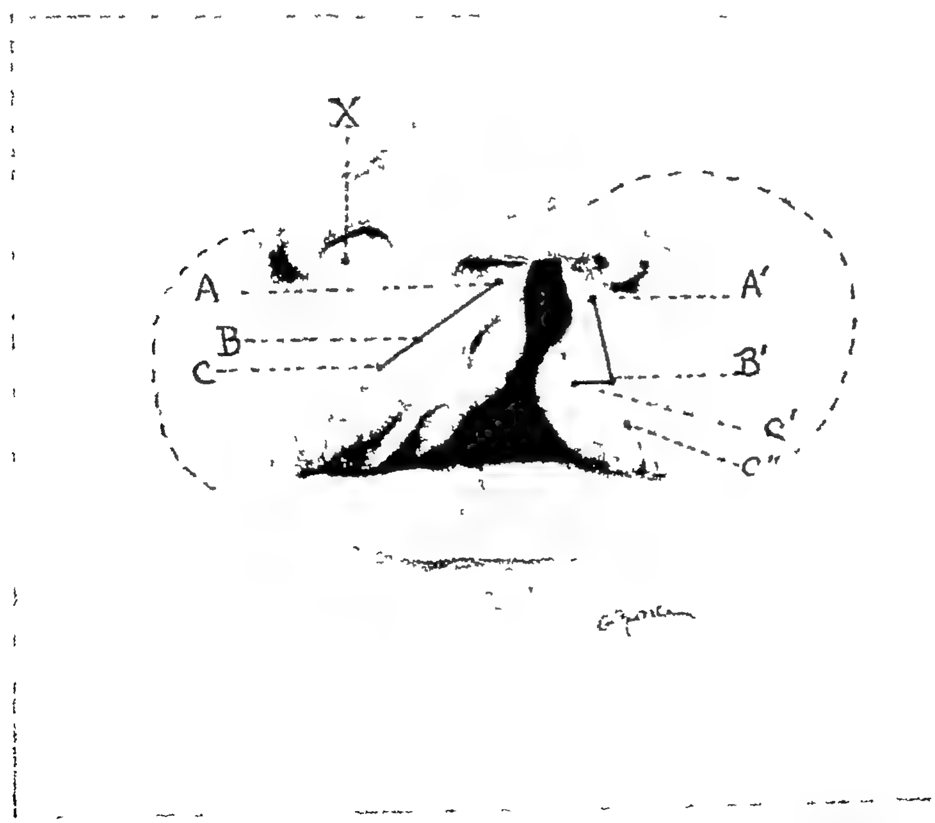


Figure 237. Simplified design for primary repair of single cleft lips, which provides for greatest possible initial nostril symmetry (From Brown and McDowell *Surg Gynec & Obst*, 1945)

SECONDARY CORRECTION OF DEFORMITIES OF THE NOSTRIL BASE AND FLOOR

In many secondary operations in which it is necessary to correct the position or direction of the nostril base, to straighten the columella, or to nar-

row the nostril floor it is best to mark out the lip in the same manner as for a primary repair and then do the secondary repair of the lip and nose at the same time This complete revision allows free repositioning of the nostril base and the columella as well as reconstruction of the nostril floor (Fig 238) The operation is similar to but more difficult than primary repairs and is best undertaken by surgeons who have had considerable preliminary experience in primary repairs (Figs 239 and 240)

Small shifts in the position or direction of the nostril base can be carried out by marking out the points *A* and *A'* and then using them as the sides of an ellipse or diamond excision locally (Fig 241) Before approximation the two sides should be undercut widely through the defect as a nostril base will not move appreciably unless it is free

Holes in the nostril floor are usually due to nonunion between the two sides, with the skin edges turned inward and downward In such instances a small hook may be inserted through the nostril into the hole to grasp the turned in skin edge a No 15 knife is then inserted underneath the lip the fornix is opened and the skin edges are undercut with the knife while upward traction is made with the hook until they come up into place and can be trimmed and approximated to bridge the floor This undercutting should be deep so the thickest possible flaps are available for the new floor

Figure 238 Design shown in Figure 237 adapted to secondary repair of cleft lips, with provision for rotation of nostril into symmetrical position.

Figure 239 Improvement in nose from plan shown in Figure 238

Figure 240 Improven n of lip and repositioning of nostril

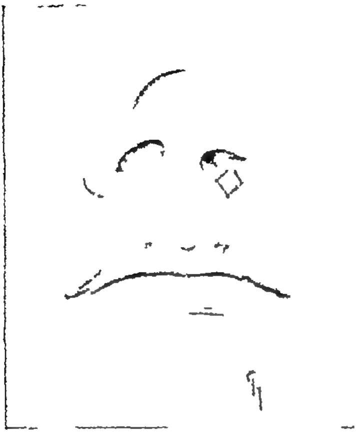


Figure 241 Plan for diamond or oval excision of nostril floor to bring cleft nostril base closer in toward the columella.

Excessively narrow nostril floors are due to loss of tissue in the original operations they are repaired by switching small flaps of skin from just outside the nostril base around to the inside to form additional floor (Fig 144) The same maneuver is occasionally necessary in repairing some holes in nostril floors where there is not enough skin available in the turned in edges

Depressed nostril floors are usually associated with retruded nostril bases both conditions may be improved by wide deep undermining and switching a flap of deep soft tissue from the cheek around and under the nostril base and floor (Fig 242)

SECONDARY CORRECTION OF NOSTRIL ASYMMETRY

The first maneuver is to get the columella straight and the nostril bases and floor symmetrical as outlined previously The periphery of the nostrils is then corrected by reconstruction of the alar cartilages, either by the eversion technique or through rim incisions as outlined in Chapters VII and VIII (Figs 243 to 246)

Simple complete undermining of the skin over both lower lateral cartilages is often followed by immediate marked improvement Following this

the two cartilages are trimmed as unequally as necessary to provide symmetrical and equal medial and lateral cruces It is usually necessary to remove some length and some width from both sides, but since the tip on the cleft side is usually not as high as on the normal side, all possible height is usually retained in the medial crus on the cleft side and the medial crus on the normal side is trimmed down to match it. If this height is less than the remainder of the nose, it is sometimes advisable to lower the entire dorsal line of the nose

Establishment of the best possible columellar-alar angle on the cleft side is an important objective Besides this trimming, a through-and-through

Figure 212 Depressed nostril floor and slumped nasal tip Corrected by repositioning of alar base, filling in behind nostril floor, and trimming of alar cartilages

mattress suture from the skin over the tip on the normal side down through the mucosa under the angle on the cleft side, may be of help

There is often an excessive thickness to the nostril wall near the base on the cleft side This can be improved by trimming out soft tissue between the alar cartilage and skin in this area and then compressing the wall by a few through and through mattress sutures

Figure 213 Correction principally by trimming and repositioning of alar cartilages.

SECONDARY CORRECTION OF A SCAR WEB INSIDE THE NOSTRIL

A semicircular web often protrudes into the nostril just above the lateral alar rim on the cleft side This is due to shortening of a scar from an incision in this area during the primary repair and occurs when this incision has been made too low between the upper and lower laterals. Trimming out the web or cutting out underlying soft tissue will not relieve it the scar

Figure 244 Nose shortened, narrowed, straightened, and alar cartilages trimmed to become symmetrical Lip revised at same operation

Figure 245 Lip revision with repositioning of alar base, and complete osteoplastic operation on nose Marked improvement in patient's economic and social status resulted

band must be lengthened. This is usually best done by a V-Y elongation as shown in Figure 247, or by rotated flaps. It may be necessary to remove some lining higher up under the nostril border but this is done with great caution

Figure 216. Complete revision of nose and lip in one operation with patient in hospital four days.

It may be said that the lining and covering are literally taken apart and are rearranged by flaps and shifts and reconstruction of the cartilage as close to normal as possible Through and through mattress sutures are often used as the best approximation If the nose has to be thus opened it should be closed as desired rather than letting scar and distortion occur for lack of proper support and fixation

Figure 247 Elimination of lateral web inside cleft nostril by using V-Y procedure to elongate it See patient in Figure 246

Figure 248 Repositioning of nasal spine and lower end of septum to straighten nose Unequal trimming of alar cartilages to produce symmetrical tip Slight skin excision on columella necessary in this patient

SECONDARY CORRECTION OF THE REMAINDER OF THE NOSE

A deviated septum and slanting nose are corrected as outlined in Chapter XIII, and it is often necessary to move the nasal spine (Fig 248) Conservative septal resections are done as indicated, good airways are particu

Figure 249 Elimination of lower nasal hump and hook and trimming of alar cartilages to eliminate buckling and restore normal vertical nostril openings.

larly important in these patients to aid in speech and to minimize any hearing loss from otitis

Excessive length is shortened as described in Chapter VI. Removing humps, narrowing wide noses, elevating saddle deformities and retruded noses are carried out as outlined in previous chapters

A number of operations have been advised which involve full thickness excisions through the nostrils, columella, or elsewhere Except for the base excision operation (which leaves an almost invisible scar in the nasobuccal fold), these operations should be avoided when possible, as they add more scars to a face that is already scarred

BALANCE BETWEEN THE NOSE AND LIPS

Correct balancing of the features or normal contour anatomy is most important in these patients The upper lip should be in advance of the lower, and the vermilion border of the upper lip should be in advance of the nostril floors In a retruded upper lip, an attempt should be made to ad-

Figure 250 Nose too small and hooked down, due to lack of septal support Correction by insertion of large L shaped cartilage transplant This will improve some cleft lip noses more than any other possible procedure.

vance it by wide undermining of it and both cheeks advancing buccal mucosa forward behind the lip to loosen it, and holding the lip forward with a dental restoration if necessary If this is not sufficient a cross-lip flap may be required this is almost specific as it tightens and pulls in the redundant lower lip at the same time that it furnishes extra tissue for advance of the upper lip

If there is any residual retrusion of the upper lip it is particularly important not to have a large nose above protruding forward or hooking down over the lip In general these patients may look best with a nose a little smaller and a little shorter than average (Fig 249)

Figure 251 Balance between features improved by advancing upper lip and by setting lower jaw back by recessive ramisection Alar cartilages trimmed and repositioned for better symmetry

CARTILAGE TRANSPLANTS IN CLEFT LIP NOSES

Some of these patients seem to have a congenital lack of septal support along with the original facial cleft, others may lose septal support as the result of infections, trauma, or operations In all such instances, worth-while improvements can be obtained by restoring the support with an L-shaped preserved rib cartilage transplant as described in Chapter XII As this fact becomes appreciated, more and more patients are seen who can be benefited by this procedure (Fig 250)

RECESSIVE RAMISECTION OF LOWER JAW

Some patients with cleft lips have heavy lower jaws that require setting back to obtain balance between the features This is done by recessive ramisection, using the closed method (Figs 251 and 333)

Chapter XVI

SECONDARY REPAIRS OF NOSES ASSOCIATED WITH DOUBLE CLEFT LIPS

NOSES ASSOCIATED WITH double cleft lips may have all the deformities described for single clefts except that they are double bilateral and more extreme.* In addition to this many of these patients have an extremely short columella or also no columella and there is frequently little or no septal support so that there is often produced a retruded nose with a tightly snubbed-down tip When this deformity becomes apparent early it may be best to elongate or reconstruct the columella at about four years of age or later to permit maximum forward growth of the tip (Figs 252 and 253)

ELONGATION OF THE COLUMELLA

The following operation has been used in many patients and has often given the best results (Fig 254)

A square flap is outlined on the upper lip beneath the columella in the remnant of the prolabium Its length beneath the old columellar base is determined by the length of new columella needed to get the nasal tip forward It is enough wider than the existing or normal columella so that it can form both sidewalls and the outer surface of the new columella Side darts may be outlined across each nostril floor to give filling for opening the tissue over the septum and at the same time to raise the lip a little in closure. These are not always needed and may make thick areas that require trimming later

With lip clamps in place to minimize bleeding the flap is incised all around through skin and subcutaneous fat. It is then elevated with its skin attachment to the columella or nasal tip protected up through the membranous septum keeping the flap about 2 to 3 mm thick. The membranous septum is cut across behind the columella out to the tip The continuous flap of old and new columella (with its pedicle at the tip of the nose) is retracted up over the tip of the nose and the tip is further freed from the septum by a cross-cut through the septum just below the tip This cross-cut allows the tip to come forward into its normal position

The flap is now folded to form the outer surface and sides of the new columella some fat being trimmed out down the middle if necessary to aid in shaping it One or two subcutaneous 000 white silk stitches between the

* Cf. Brown J B and McDowell F Secondary repair of cleft lips and their nasal deformities Ann Surg 114 101 1941

two sides will often help in shaping it The new columella is now set up into place, with the side darts filling in the septal cross-cut If the position is satisfactory, it is united to the mucous membrane of the septum on both sides by fine silk sutures, trimming as necessary to get the best shape and position It is often helpful to anchor the base of the columella with a single subcutaneous 000 white silk stitch to the periosteum or other tissues around the nasal spine region This helps relieve the right angle tendency, which is changed into the straight line of the new columella The lower ends of the medial cruces of the alar cartilages will sometimes require trimming to get a good, straight, smooth, new columella

Figure 252 Many children with total double clefts have almost no columella at birth or following primary closure of lip (*left*) In these elongation of the columella (as shown in Figure 254) produces marked improvement in the whole nose (*center* and *right*)

The two limbs of each dart opening are closed in an attempt to get some elevation of the lip The remainder of the defect in the lip is closed by bringing the two sides together and excising a small triangle above the vermilion border to prevent any lumping up

The nostrils are lightly packed with fine mesh grease gauze, and an external aluminum nasal splint is applied The lip sutures are covered with another piece of the same grease gauze, then some plain gauze and narrow strips of Elastoplast from cheek to cheek

The patient is not allowed to bite with the front teeth or to suck on a straw, and the lip and columella are dressed every day or two and cleaned

Sutures are usually removed in about one week and healing may be complete then or within a few more days

In closing the lip defect it is necessary to sew these edges to each other and not to the base of the new columella otherwise in healing the lip may tend to pull the base of the columella down into the lip to form a web

There is a tendency to elongation of the lip by this procedure which is aided some however by the slight elevation afforded when the darts in the nostril floors are closed At times it may be best to cover the lip defect with a free full thickness graft rather than to tighten and elongate the lip by primary closure This graft may also be required later if there is too much scarring

There is a question as to whether the prolabium belongs to the columella or to the lip but when it is observed that the columella formed this way in a male sometimes must be shaved, then the argument is in favor of the lip Occasionally the newly formed columella retracts too far into the nose and if this happens about the only correction worth while is to insert a costal cartilage implant.

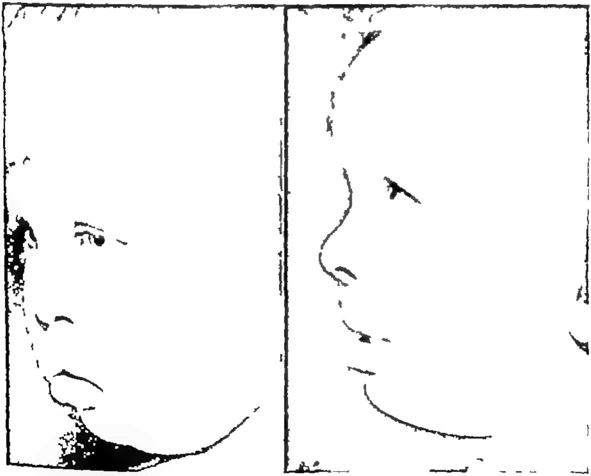


Figure 2.3 Three year old child shown before and ten days after elongation of columella

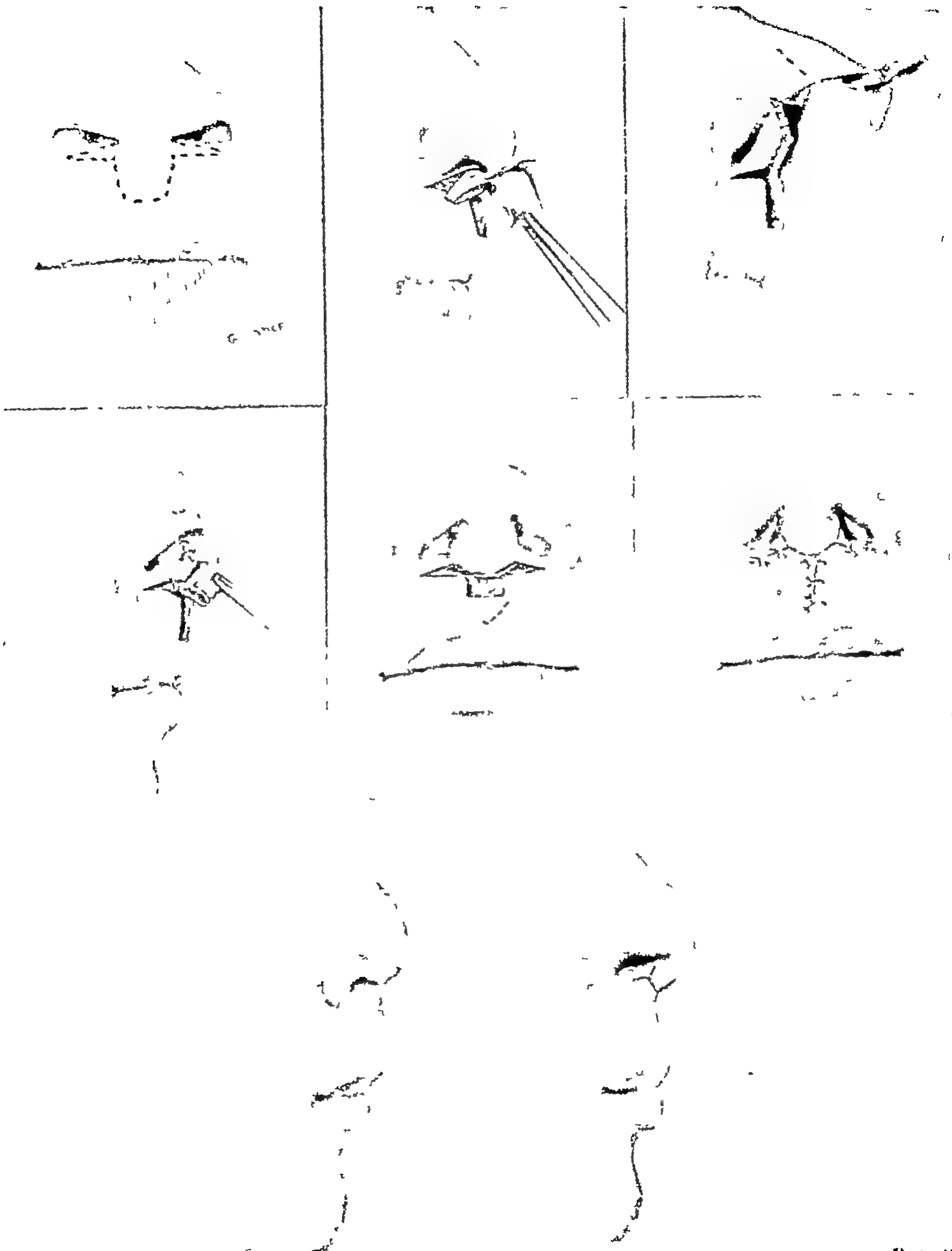


Figure 251 Drawings of columellar elongation operation described in text (From Brown and McDowell, *Ann Surg*, 1941)

Figure 255 Appearance of patient in infancy and at age of twenty-one years. Corrective operations were done in early childhood and consisted of (1) elongation of columella (2) chiseling out bone to eliminate web between columella and lip and (3) cross-lip flap to loosen and advance upper lip. Patient happily married.

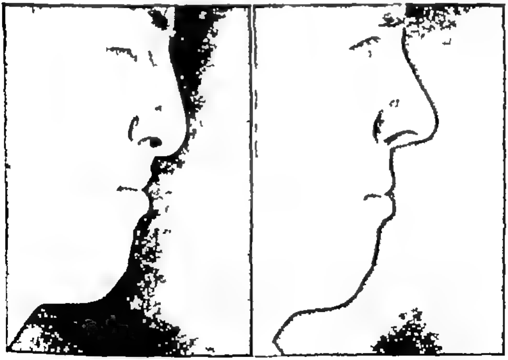


Figure 256. Elongation of columella in adult, and addition of rib cartilage transplant for support

When the upper lip is too tight following this procedure, vanced later by a cross-lip flap operation, and this is often requ

If the premaxilla has been jammed up into the nasal spine i vious operations, a bony web may persist at the columellar-lip will require later chiseling out to get a good right angle (Fig

This operation does create a columella of normal length, a of the nose to grow forward, eliminates the snubbed appeara proves some of these noses more than any other method (Figs 2

CARTILAGE TRANSPLANTS IN DOUBLE CLEFT LI

Some partial double clefts have a fairly normal columella ar good septal support to the nose Most double clefts will hav columella and poor septal support In many of these, it is worth sert an L-shaped preserved rib cartilage transplant for suppor In the worst cases, one transplant can be put in at early scho courage growth, and then it can be removed and replaced w transplant at intervals, or after complete growth has been obtai sary Autogenous cartilage can be used if warping is not feared is a possibility that it will grow better

Figure 257 *Left,* Patient at age of two years, with almost no columella and tip *Center,* Elongation of columella was done a little later with result sh seven years *Right,* Following this, cartilage transplant was added for conto

tient The condition can be alleviated by partial excision of the nostril bases to afford great relief to the patient and his family (Figs 259 and 260)

Figure 258 Improvement in two operations in adult. First operation consisted of revision and advancement of lip with addition of dental prosthesis for support of lip Second operation was complete osteoplastic on nose to straighten narrow and shorten it, and to eliminate tip cartilage deformities (profile views of same patient in Figure 327)

OTHER NASAL DEFORMITIES ASSOCIATED WITH DOUBLE CLEFT LIP

Abnormalities of the nostril floors nostril bases or the alar cartilages are corrected as described in Chapter XV Deviations of the nose removal of humps, narrowing of the nose shortening of the nose etc. are performed as outlined in previous chapters (Fig 258)

If the premaxilla has been jammed upward by previous operations, it may present in one or both nostril floors, or teeth may grow up through the floors, obstructing the nasal airways These are often the cause of recurrent nosebleeds in these patients, and should be carefully looked for in those with such a history Any such bony obstructions or teeth are removed with preservation of as much mucosa as possible

BALANCING THE PROMINENCE OF THE NOSE, LIP, AND CHIN

Proper balance between the features is more important than any one feature in these patients, as in others (cf Chapter XXIII) At times, the nose

Figure 259 Flaring and flatness of nostrils in double cleft Relieved by nostril base excisions This is considered the final operation in double clefts

Figure 260 Marked improvement by nostril base excision in another patient with double cleft lip

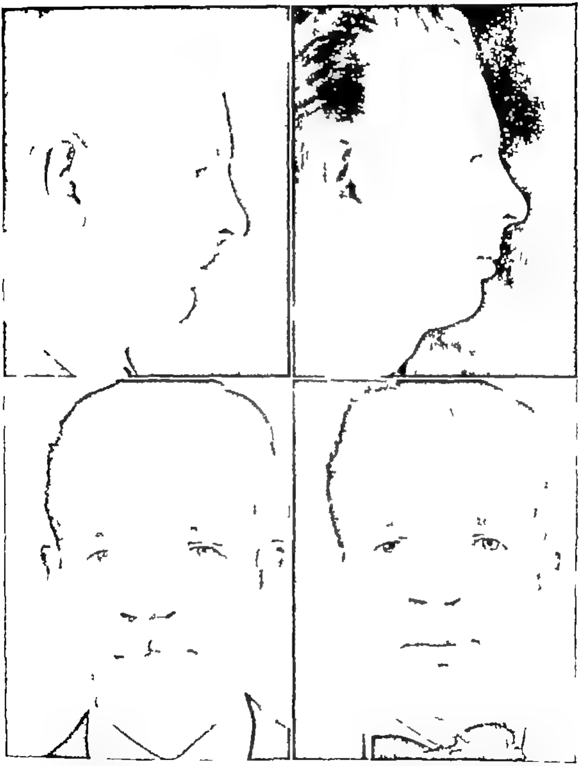


Figure 261 Usual retrusion of upper lip in double cleft with appearance of too large nose. Improved most by cross-lip flap to bring upper lip forward.

may look too large when the real trouble is a retrusion of the lip (Fig 261) or a retrusion of the chin Conversely, a nose may look too small due to a very large chin.

The lip may be retruded because of mucosal tightness, or insufficiency of soft tissue throughout the lip, or because of lack of dental support In the first instance, correction is by advancement of mucosa from the cheeks, in the second, a cross-lip flap is required, in the third, orthodontia may help and if not, a dental prosthesis may be used for support (cf Chapter XXIII for details)

SECTION 5

REPAIRS WHICH INCLUDE THE GRAFTING OF SKIN

Chapter XVII

SKIN GRAFTS TO THE NOSE*

FREE SKIN GRAFTS are used for resurfacing part or all of the nose when the original skin has been destroyed or damaged. Such occurrences may result from burns, radiation dermatitis, traumatic losses, port wine stains, large nevi, and other superficial tumors. Pedicle flaps are used for restoring deep losses, but it is a mistake to use them when only resurfacing is required. Burned noses rarely require a flap repair (Fig. 262). Free composite grafts of cartilage and skin are invaluable for restoration of small deep or full thickness losses about the columella and nostril rims.

The three varieties of free skin grafts are: (1) split thickness grafts, (2) full thickness grafts, and (3) pinch grafts. The latter are too unsightly for use on the nose and should never be considered for this purpose.

SPLIT THICKNESS SKIN GRAFTS TO THE NOSE

Split grafts are cut in sheets consisting of part of the thickness of the skin. The donor area heals smoothly from remaining stumps of hair follicle and sebaceous gland epithelium in eight to ten days. The relative thickness of the grafts may be from one half to three fourths or more of the full thickness of the skin; in general, the thicker grafts tend to have a better and smoother final appearance and have been preferred for use on the face on our service for many years. The absolute thickness of the grafts as measured in millimeters or microns has no significance, since skin is elastic; it will vary in measurement according to the amount of tension on it. However, it should be noted that split grafts from thick skinned areas (such as the back of an adult) may be much thicker than full thickness grafts from areas in which the skin is naturally thin.

Split grafts are invaluable because of the ease of "take" and their ability to conform to very irregular surfaces. They will take on granulating wounds, fat, fascia, muscle, perichondrium (but not bare cartilage), and periosteum, but not bare cortical bone. They will take in the presence of a moderate amount of bacterial contamination, so that they should always be used for covering granulation areas which have been ulcerated recently, or in other situations where infection is feared.

Cutting split grafts is much easier than it is generally considered to be and can be mastered by almost every surgeon with a little practice. The main

*For more detailed information on this subject, see Brown, J. B., and McDowell, Frank: *Skin Grafting*, ed. 2, Philadelphia, J. B. Lippincott Company, 1949.

essentials are a flat surface and a long, sharp knife The skin surfaces or thighs, buttocks, back, abdominal wall, or inner surfaces of the arms ca flattened by stretching between two boards or better by the use of a sp suction retractor (Fig 263) An amputation knife, carving knife, or long, sharp knife may be used, but the special skin-grafting knife with i changeable blades (Fig 263) is cheap and convenient With the skin flat and taut, the knife blade is laid upon it flat and parallel with the sur A little straight downward pressure is made on the knife (without rot the edge of the blade inward or outward), and the graft is cut with l easy strokes of the knife back and forth The correct plane is in the de which presents some resistance to cutting, and the knife naturally tend stay in this plane if the blade is not rotated The correct thickness is that the knife blade can barely be seen, or can almost be seen, through graft The vacuum retractors in three sizes give valuable help in obtai these grafts

Figure 262 Total burn of face with resultant masklike rigid scar and exposure of Nose both cheeks all four eyelids and forehead resurfaced with soft, pliable split grafts Flaps are almost never necessary for these burned noses

struments and they are supplied in various forms Padgett Hood Reese Barker vacutome Brown electrodermatome Caltagirone etc.

Preoperative preparation of granulating wounds is important. Daily mechanical cleansing is done with soap (or a detergent) and water ether or benzene may be used to get rid of any grease or old ointment particles It is especially necessary to cleanse the surrounding skin and remove any serum crusts, scales or other detritus which may serve as foci for the growth of *Bacillus pyocyaneus* or other carrion organisms which may soil these wounds The occasional use of 10 per cent mercurochrome or other dye antiseptics may help in keeping these organisms in abeyance. Pressure dressings are applied each time with fine mesh gauze (either wet with saline solution or coated with the thinnest possible amount of a bland ointment) next to the wounds This is covered over with a layer of surgical waste and a forehead nose splint (Fig 161) is molded and strapped firmly over all Several days preparation is nearly always necessary The wound is ready for grafting when

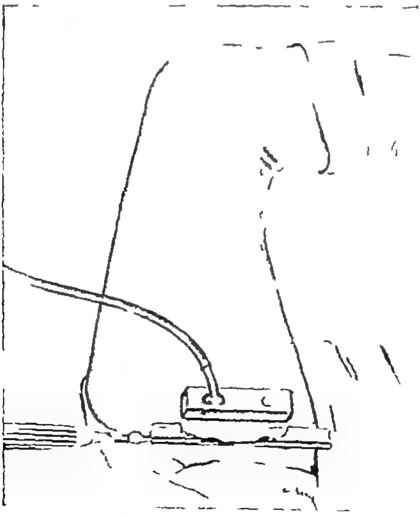


Figure 263 Method of cutting thick split skin graft from back of thigh using suction retractor and long sharp knife

the granulations are flat firm, fine, and bright red in color, there should be no cellulitis in the surrounding skin and the discharge from the wound should be small in amount and not offensive in odor The green color and musty odor of pyocyaneus diainage is an especial contraindication to grafting Exuberant granulations are usually edematous and infected, they are not treated by cauterizing but by the regime just described until the edema is out and they are flat and fine

Operative preparation in granulating wounds consists of cleanly slicing the granulations (and surrounding bluish scar epithelium) off in a sheet,

Figure 264 Application of split skin graft over entire nose Edges of graft overlap edges of defect slightly and fixation is by fine running silk suture For dressing the graft is covered with fine mesh grease gauze a thin layer of surgical waste and an external aluminum splint with forehead attachment (nostrils lightly packed)

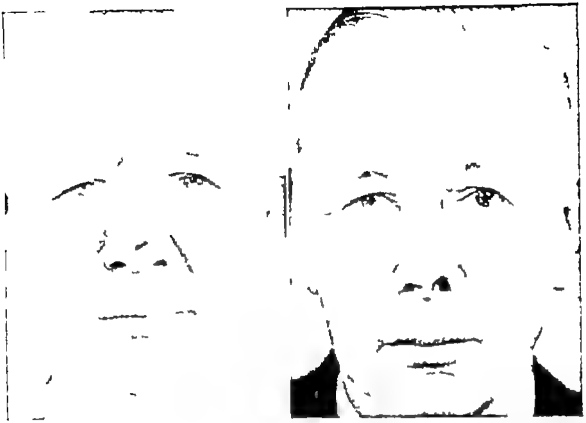


Figure 265 Resurfacing of entire nose with single split skin graft.

and applying pressure with gauze sponges wrung of of 1 5000 adrenalin solution until complete hemostasis is obtained Any spurting vessels may be individually tied with 000 white silk cut on the knot but the smallest possible amount of foreign material under a graft is the best. Healed areas are prepared by carefully dissecting off the involved skin or scar in one layer with straight definitive edges care is taken to avoid exposing any bare cartilage or bone though a split graft will often bridge over a few millimeters of such structures. Hemostasis is obtained as outlined previously

Suturing the graft to the surrounding skin is the best method of fixation A fine running stitch of 000 black silk is used piercing the graft then the skin margin then back out the graft This is facilitated by being generous with the graft so that it overlaps all skin margins by about 1 cm The stitches should be close together and not more than 1 to 2 mm in width (Fig 264) Various biological glues and other substances have been used for fixation of grafts, but are too uncertain to obtain routine perfect takes on the nose

Dressings consist of a single layer of fine mesh grease gauze, then a layer of surgical waste with a forehead type of nose splint firmly molded and strapped over all Packs inside the nostrils prevent them from collapsing and aid in obtaining pressure over them. The first dressing is done in four or five days at which time the packs are changed the sutures are removed

and any excess graft edges are trimmed off Any blisters or small hematom are incised, and the same type of dressing is reapplied It is then chang every day or two until the graft is secure enough to leave all dressings o (usually about ten to fourteen days after operation)

Donor site dressings consist of a double layer of fine mesh grease gau (5 per cent scarlet red in petrolatum may be used) covered by a thick lay of plain gauze bandaged or strapped firmly in place It is left untouched f ten to twelve days and can usually be removed and left off at that time

Sufficiently large excisions of scar or damaged skin are important If th whole nose is involved, the entire nose should be resurfaced, and it is bett to do it with one single large graft than piecemeal (Figs 262 and 265 However, it is usually better to avoid extending a graft from the nose ov onto the adjacent cheek or eyelids, though after some experience exceptio can be made in this (Figs 266, 267) If the nostrils are pulled up, or th nose twisted by external scar, it is essential to continue the scar remov until the deformity is relieved as much as possible, before applying the gra It is also important to maintain the subcutaneous contour of the nose, as th graft is just a thin covering and will readily conform to it

Figure 266 Radiation dermatitis from treatment of nevus Nose, forehead, and eyeli resurfaced with thick split skin grafts

FULL THICKNESS CLAVICULAR SKIN GRAFTS TO THE NOSE*

The best matches in color and texture are frequently obtained on th nose by the use of soft, pliable, full thickness grafts removed from the clav cular region These grafts are valuable for resurfacing areas, up to one-thir

*Cf Brown, J B and Cannon, B Full thickness skin grafts from neck for function an color in face repairs, *Ann Surg*, *121* 639, 1945

of the nose which have been damaged by burns, radiation superficial tumors blemishes or other causes (Fig 268)

After sharp excision of the damaged area a pattern of the defect is cut in clear celluloid or bleached x ray film The skin around the clavicle is then examined and an area selected which matches the nasal skin in color or texture such an area will frequently be found overlying the clavicle or just above it.

Figure 267 Excision of widespread "field-fire" basal-cell carcinoma of nose and cheek, and immediate repair with full thickness skin graft from clavicular region.

The donor clavicular area is then stretched flat pulling it down a little on the chest wall if necessary and the pattern is traced on the skin with 5 per cent methylene blue and a pen With assistants holding the skin stretched taut in all directions the outlined pattern is lightly cut just through the skin with a No 15 scalpel (Fig 269) With tension maintained one corner of the graft is elevated and the graft is undercut with successive light strokes of the knife until it is removed The correct plane is within the little fine white fibers which attach the derma to the subcutaneous tissue The maintenance of continuous tension in all directions by the assistance throws these white fibers into relief so that they break themselves against the sharp knife blade whenever lightly touched the elastic fibers of the derma are tougher and are not cut through by these light knife strokes An extremely sharp

knife edge, strong tension of the skin, and light strokes of the knife blade are the main essentials for removing the graft in the correct plane

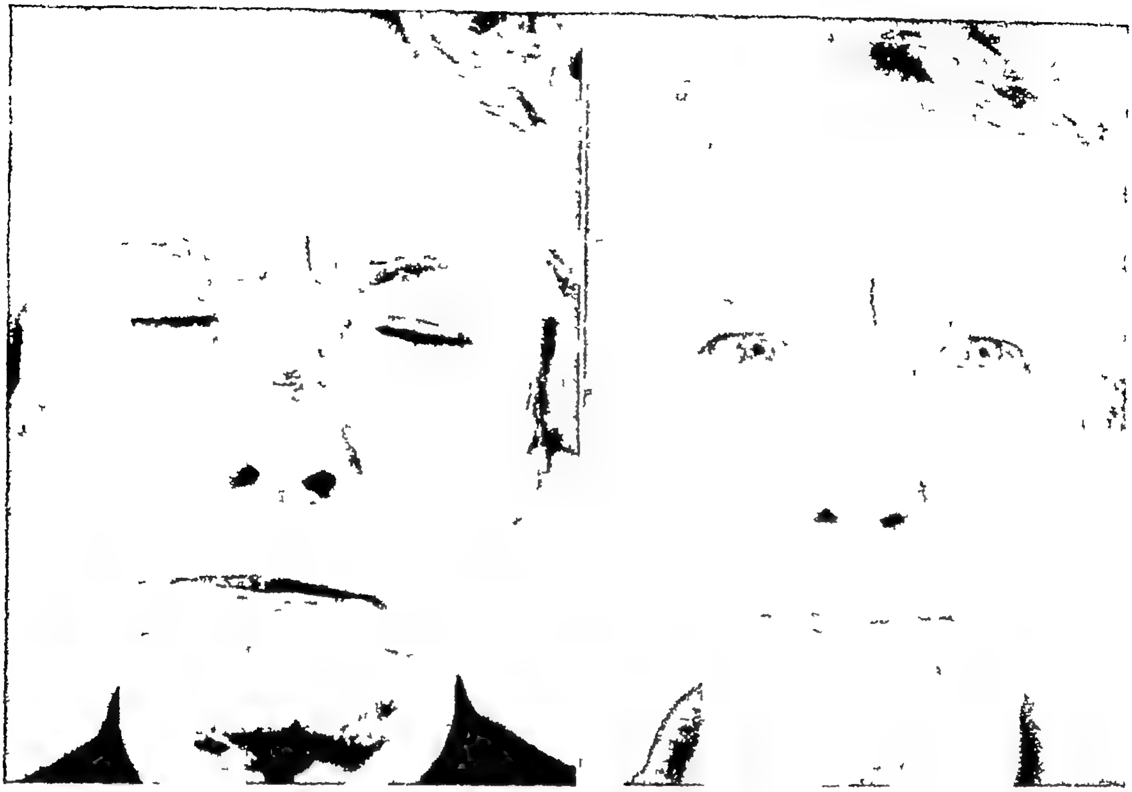


Figure 268 Excision of residual basal-cell carcinoma of nose and surrounding radiation dermatitis, with immediate repair by full thickness skin graft

After placing the graft in the nasal defect, it is sewed in edge-to-edge with fine silk, interrupted, with the ends left long (Fig 270) The graft is then covered with a layer of fine mesh grease gauze and a pad of surgical waste, and the long ends of the sutures are tied together over the waste (the so-called "stent" method of fixation) The nostrils are packed lightly, a little loose waste is draped over the rest of the nose, and a forehead type of aluminum nasal splint is secured over all At times, the dressing may be done without the form being held on with sutures

The donor area is closed by undermining the suturing, excising triangles at the ends, if necessary A careful closure with interrupted, subcuticular, white silk sutures and then interrupted, surface, fine black silk sutures is advisable for the least noticeable final scar

Subsequent dressings and care are the same as for split grafts, except that the sutures should be left in a few days longer in full thickness grafts

When the clavicular skin is not available, postauricular skin may be used but it will sometimes be redder than the nose. Skin from other parts of the body will often appear excessively white on the nose

SKIN GRAFTS INSIDE THE NOSE

Free skin grafts will take quite well inside the nose for replacement of lost mucosa or vestibular skin However in mucosal replacements, the grafts may secrete sebum and have a disagreeable odor so that they should be avoided except when there is no other alternative. Unfortunately free mucosal grafts from the mouth are inclined to shrink so much that their use is not recommended.

Using free skin grafts in the nose is not comparable to using them in the mouth because there is enough secretion in the mouth to keep them moist and not so inclined to develop odor

The excision of small local carcinomas and other tumors from the mem

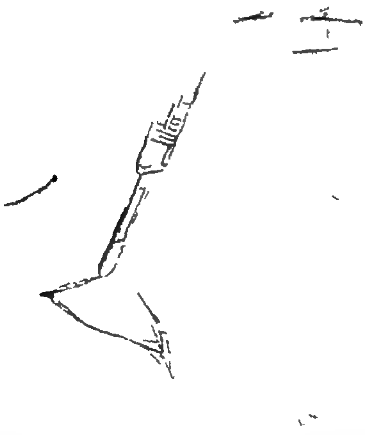


Figure 209 Cutting of full thickness skin graft from the clavicular area After cutting around the graft the skin is stretched taut and the graft is carefully dissected off with a scalpel staying in the plane between the derma and subcutaneous tissue The donor site is closed by undermining and suturing These grafts are quite soft and provide the best match in color and texture for the face

branous septum may leave defects which are best repaired by small full thickness grafts

When considerable amounts of lining are missing from congenital atresia, traumatic loss, chemical burns, or specific infections, replacement is best effected by a large sheet of split skin graft Scar is dissected out until the airway can be distended to much larger than normal with a nasal speculum If possible, a small flap is obtained from the neighborhood and sutured across some part of the defect in order to prevent circular grafting around the perimeter (circular border scars on grafts tend to contract markedly) Hemostasis is obtained by temporarily packing with gauze wrung out of weak adrenalin solution

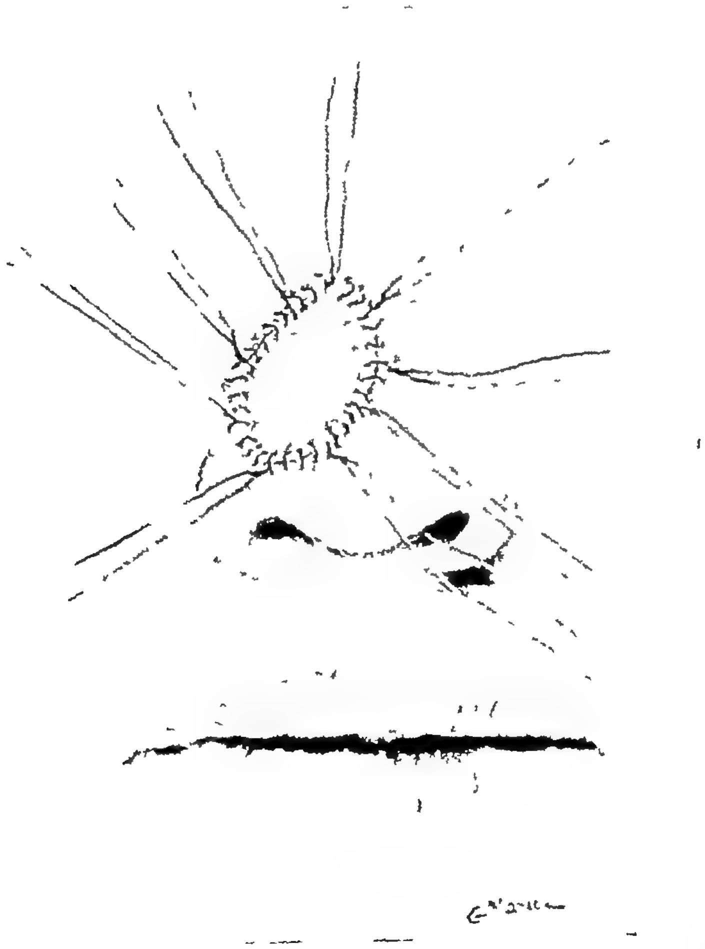


Figure 270 Fixation for a small full thickness graft on the nose Graft is covered with a layer of fine mesh grease gauze, a small pad of surgical waste, and the long edge sutures are tied together over them

A split graft for lining should be cut thin and from a relatively hairless area The graft is draped in a sheet over the nostril opening, and the end of an iodoform gauze pack is placed against the center of it This is introduced

through the airway back past the defect. The packing is then continued until the airway is overdistended with split graft in contact with all raw surfaces; overlapping of portions of the graft onto healed surfaces is of no consequence. The opposite nostril is lightly packed and an external aluminum splint applied for counterpressure.

The packing is carefully removed on the fourth day and any excess graft trimmed out. The graft is cleaned with wet applicators, a little 10 per cent mercurochrome applied to the edges, and the airway packed in overdistention again. This is repeated every day or two until two or three weeks after operation, when the graft is solidly healed. Some late shrinkage may be expected (Fig. 271).

For further important considerations about skin grafts to the nose, refer to Chapter XXVIII, War Injuries of the Nose.

Figure 271. Atresia of nostrils from smallpox in infancy repaired in one operation by switching flaps from outside alar bases inside to form nostril floors, excision of scar inside nostrils, and packing in split skin grafts.

Chapter XVIII

TREATMENT OF RADIATION LESIONS OF THE NOSE

CHRONIC, PROGRESSIVE, irreversible changes in the skin may be produced by radiation treatment in any patient, and perhaps by mild doses in over-susceptible patients.* These changes are not stopped by any known drug and the only possibilities in treatment are palliation (in mild lesions in elderly individuals), or surgical cure by excision of the involved skin and grafting the area. The worst advice is to treat these lesions by further radiation—ultraviolet, radium, or x-radiation; this might be called malignant homeopathy.

Successive doses of radiation are cumulative to the extent that skin will not tolerate many times the maximum single dose, no matter how finely divided nor over how long a time it may be given.

Most radiation lesions of the nose are the result of treatment—for hemangiomas in childhood (Fig. 272), acne in adolescence (Fig. 273), eczema at any age, or for lupus or malignancies in adult life. One of the worst features is the delayed, insidious onset of symptoms—often many years after the last treatment, so that the true diagnosis may not be suspected until the lesions are well advanced.

The first change in the skin is atrophy, which may not appear until months or years after treatment. In this stage, the skin becomes thin, slick, glazy, and at times excessively white. On microscopic examination, the derma will be thinned out with loss of elastic fibers, sweat glands, sebaceous glands, hair follicles, and replacement by collagen. The epithelium is thin, with few or no rete pegs, but relative thickening of the stratum corneum is a clue to its rapid growth and short life cycle. Along with this stage appears progressive occlusion of the vessels at the junction of the derma and subcutaneous tissue by endarteritis and endophlebitis, the latter often being even more severe than the former.

Later, a spidery network of dilated blood vessels appears just beneath the epithelium, producing a mottled reddish appearance to the skin throughout the area. These telangiectases are dilated capillaries in the superficial part of the derma, and are possibly caused by back pressure from the deeper endophlebitis, or from breakdown of elastic tissue throughout the skin. Along with this progression from atrophy to its combination with telangiectases, keratosis of the epithelial surface may become more marked.

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*Cf. Brown, J. B., McDowell, F., and Fryer, M. P.: Surgical treatment of radiation burns, *Surg., Gynec. & Obst.*, 88:609, 1949.

Figure 272. Radiation dermatitis of nose and adjacent cheek from treatment of hemangioma in childhood Excision and immediate repair in one operation by use of free full thickness skin graft. (From Brown McDowell, and Fryer *Surg Gynec & Obst* 1919)

Figure 273 Radiation dermatitis of most of face from treatment of acne in adolescence As usual, the nose being closest to the tube was burned the worst Result shown after resurfacing the nose lip and both cheeks, with free split skin grafts. Flaps are not required except for deep losses or to bring in new blood supply in completely avascular areas. (From Brown McDowell, and Fryer *Surg Gynec & Obst* 1919)

Figure 274 The best time to resurface a radiation burn is in the early stages of atrophy and telangiectasis, before the development of chronic ulcerations and carcinoma

"Coal spots" appear next in the progression These are clotted telangiectases and appear grossly as little black spots within the skin They soon swell, rupture the vessel walls, and then behave as any other foreign body stimulus just beneath the epithelium The surface epithelium grows around underneath each "coal spot" and finally extrudes it to the outside The constant repeated stimulation of the surface epithelium by this process results in faster and faster growth with a shorter and shorter life cycle of the cells until they seem to overcome all inhibitions and grow wildly without purpose or definite pattern

Thus carcinoma is the final stage in these lesions if they progress fast enough and if the patient lives long enough The decision as to the advisability of resurfacing an area in a given patient is governed by (1) the stage of the lesion when first seen, (2) the age and general health of the patient (3) the rate of progression of the lesion as judged by the time interval since the last radiation At times, the skin will go through all stages from atrophy to carcinoma within a year or two after a single massive dose. More often, atrophy first appears several years after small repeated doses and then progresses through the various stages to carcinoma over a ten- to thirty-year period

Paradoxically, the best time to resurface the nose is in the early stages of atrophy and telangiectasis (Fig 274), before multiple keratoses, "coal spots," ulcerations, and carcinoma are present (Figs 275, 276, and 277) All of

these latter lesions harbor a large variety of bacteria and the subcutaneous tissue has a poor minute blood supply so that the problems in skin grafting are increased after these late manifestations appear Nevertheless most of these lesions can be resurfaced better and more expeditiously with free skin grafts than with pedicle flaps provided that the work is done before actual deep invasion by carcinoma

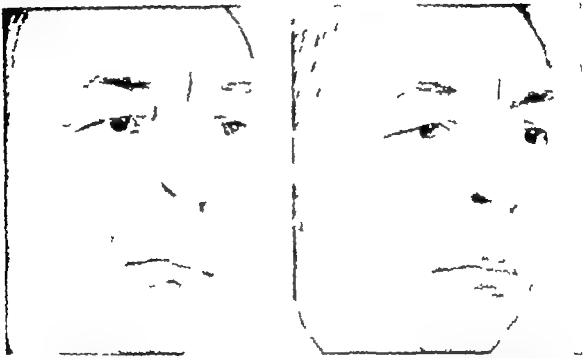

Figure 275 Later radiation burn with carcinoma development and removal resulting in distortion of nose. The first step in such a repair is to excise all of the damaged skin and immediately resurface the area with a free skin graft before further trouble occurs.

In many patients the surrounding cheeks lips and other areas will also be involved and require resurfacing but since the nose is prominent and usually nearest to the source of radiation it is frequently the most involved (Figs. 276 and 277) In such patients the entire nose should be resurfaced first, and the cheeks lips and other areas done in separate stages later

This skin grafting is nearly always best done under endotracheal general anesthesia. The area of skin to be excised is outlined with a pen and methylene blue and it is then removed by sharp dissection care being taken to avoid exposing any of the cartilages or bones and trying to maintain the subcutaneous contour of the nose as well as possible (though radiation often causes some atrophy of the subcutaneous tissues as well) If there are any carcinomas in the area excision will have to be deep enough under them Hemostasis is obtained by tying any spurting vessels with 000 white silk and by using prolonged pressure with weak adrenalin or warm saline sponges to control oozing It must be complete as these lesions are particularly prone

to develop hematomas under grafts This is somewhat of a paradox as the minute blood supply is poor, but some of the arterioles stiffened by endarteritis may stop bleeding spontaneously before they are tied, only to open and bleed later under the graft

If about one-third of the nose or less is to be resurfaced and the lesion is still in the early stages without ulcerations, a full thickness graft from the clavicular region may be used for the best color match Otherwise, it is best to rely on thick grafts for certainty of "take" The best match in a split graft is often obtained from the lower anterior chest wall (just beneath the breast), a fairly thick graft being cut with one of the mechanical appliances. However, thick grafts cut from the buttock with a knife may also be used

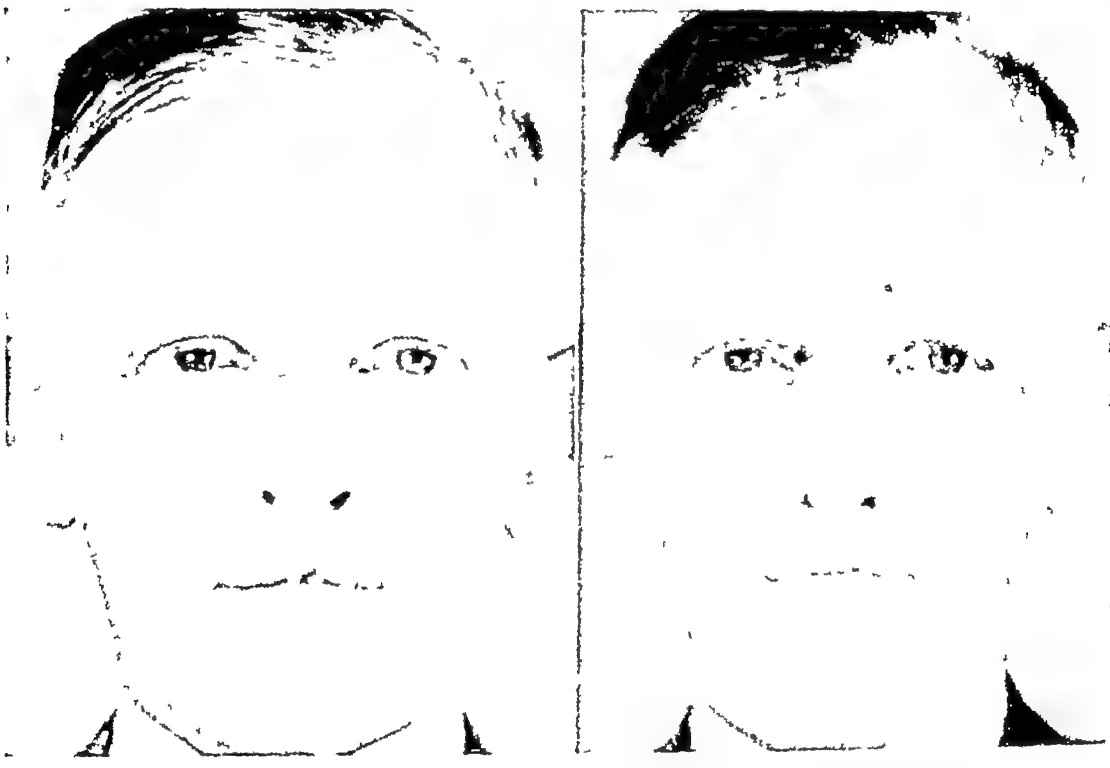

Figure 276 Radiation dermatitis, worst on nose and lip, with development of several small carcinomas in these areas Result of resurfacing nose and lip shown Patient may require subsequent resurfacing of other areas

The graft is sutured in place, immobilized, and a pressure dressing applied as described in the last chapter, and the after care is the same However, these avascular areas are notoriously poor beds for grafting so that more losses must be anticipated These do not preclude subsequent successful grafting

In addition to the effect on the skin, radiation affects the other structures of the nose to a lesser extent The atrophy and collagenization of the subcutaneous tissue may produce almost a skeletal outline to the contour of the

nose The mucosa may be atrophic telangiectatic and bleed easily so that all packs within the nose should be greased gauze (xeroform or some other bland ointment mercurials should not be used inside these noses on radiated skin or on grafts over these areas) It is seldom necessary to do any grafting inside the nose but the patient may complain of dryness burning and bleeding which can be relieved somewhat by meticulous greasing of the mucosa once or twice daily

Severe spot radiation from radium or radon may burn a hole all the way through the nose. If the dissection can be carried out to an adequate blood supply on all sides and the area is not too large a composite graft may be used for repair otherwise a flap repair will be necessary and local flaps are likely to be more avascular than those brought in from elsewhere

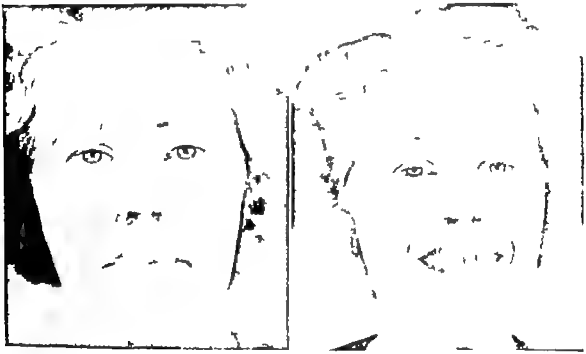

Figure 277 Excision and skin grafting of worst areas of radiation dermatitis, on nose and both cheeks. Advisability of repairing nostril rims with composite grafts under consideration

General radiation will sometimes produce necrosis of parts of the tip cartilages with ragged nostril edges An attempt to repair these with composite grafts can be made if it is thought that the blood supply of the adjacent tissue is good enough to carry them

At times, most of the nose will be cooked through and through by massive repeated radiation for a very bad carcinoma There may be spotty necrosis of cartilage and bones as well as multiple changes and ulcerations in the skin and mucosa often with some question as to whether the original carcinoma has been controlled In such instances the entire nose should be

excised flush with the face If the blood supply of the surrounding "platform" seems adequate, a repair can be made with a forehead flap, or a flap from some other source Otherwise, a prosthesis may be the only solution, and skin grafting of the surrounding cheeks and lips may be necessary.

This discussion is not intended for any directional effect on the problems of radiation therapy Some of the lesions for which it offers the best or only hope are dangerous to life, others make the patient's life a torment so that some relief is demanded Actually, it has been found that the ability to repair radiation lesions has extended the usefulness of this therapy in some instances

Chapter XIX

COMPOSITE FREE GRAFTS OF SKIN AND CARTILAGE FROM THE EAR TO THE NOSE*

DEFECTS ABOUT THE TIP of the nose, the ala, and the columella are best repaired by free composite grafts of two surfaces of skin and intervening cartilage from the ear (Figs. 278 to 290), or with one skin surface or part of the lobe when indicated. The repair often can be done in one procedure with the most normal appearance resulting of any method. There is minimal deformity of the donor site and the use of bulk flaps is avoided. The ear can be repaired locally or by burying the open ear under a direct skin flap from behind, then freeing it and closing the scalp donor area two to three weeks later.

The procedure is useful for tissue losses from trauma (Figs. 288, 289, and 290), burns (Figs. 284 and 287), tumors (Figs. 283, 285, and 286), operative losses, and gunshot and shell fragment wounds. It is necessary that there be a satisfactory minute blood supply in the recipient area, and the defect has to be opened widely and deeply over a sufficient area to arrive at the necessary minute blood supply. This enlarges somewhat the original defect, and allowance is made for this in designing the size of the graft.

The size of the possible tissue replacement, of course, is limited. The whole columella, tip, and one nostril border have been put in at one operation, and also both nostril borders. A great bulk of tissue, however, cannot be transplanted as a free graft. The usual maximum is a little more than 1 cm in width or length, whichever is the shortest. The other diameter can be as long as necessary, the important point being to try to have no tissue in the graft much more than 1 cm from its nearest source of blood supply. The apparent size may be increased if an extra amount of full thickness graft is taken up with the composite graft and attached to a suitable raw area.

The amount of available ear structure is also a determining factor. The rim of the ear and adjacent parts of the concha are usually used for nostril border defects. The crus and top of the helix may be used for filling in defects at the columellar-alar angle, together with adjacent portions of the columella and ala. Full thickness wedges from the rim inward may be used in opening collapsed nostrils. If the crus of the helix can be used, the defect

* Brown, J. B., and Cannon, B., Composite free grafts of skin and cartilage from ear. *Surg., Gynec. & Obst.*, 82:253, 1946.

Idem. Composite free grafts of two surfaces of skin and cartilage from ear. *Ann. Surg.*, 124:1101, 1946.

is easiest closed and least noticeable Portions of ears with burned off rims have been used for some nostril repairs, and the subsequent ear repair is about the same as it would have been even without the nose graft

Figure 278 Composite graft of ear to nostril The border scar is removed and discarded The edges are then separated and dissected back to obtain a good minute blood supply

Flat grafts from the back of the ear, consisting of only one layer of skin and cartilage, are used for filling in some defects and depressions about the dorsum and tip of the nose when the lining is still intact The use of these has avoided some extensive nasal repairs in patients with carcinomas about the tip; if the lining is not involved, the excision may be carried through the skin and alar cartilages well around the tumor, and the defect immediately filled with a flat composite graft (Figs 285 and 286)

Free grafts from the ear lobe have been u for replacement of nostril
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and clean-cut contours, as well as support

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A B

Figure 279 *A* and *B* Removal of full thickness composite graft of cartilage and two skin surfaces from ear Care is taken to avoid separating either layer of skin from the cartilage. Left lower inset shows graft. Repair by burying raw edge of ear under postauricular flap is shown in *B* or by direct closure if from crus of helix

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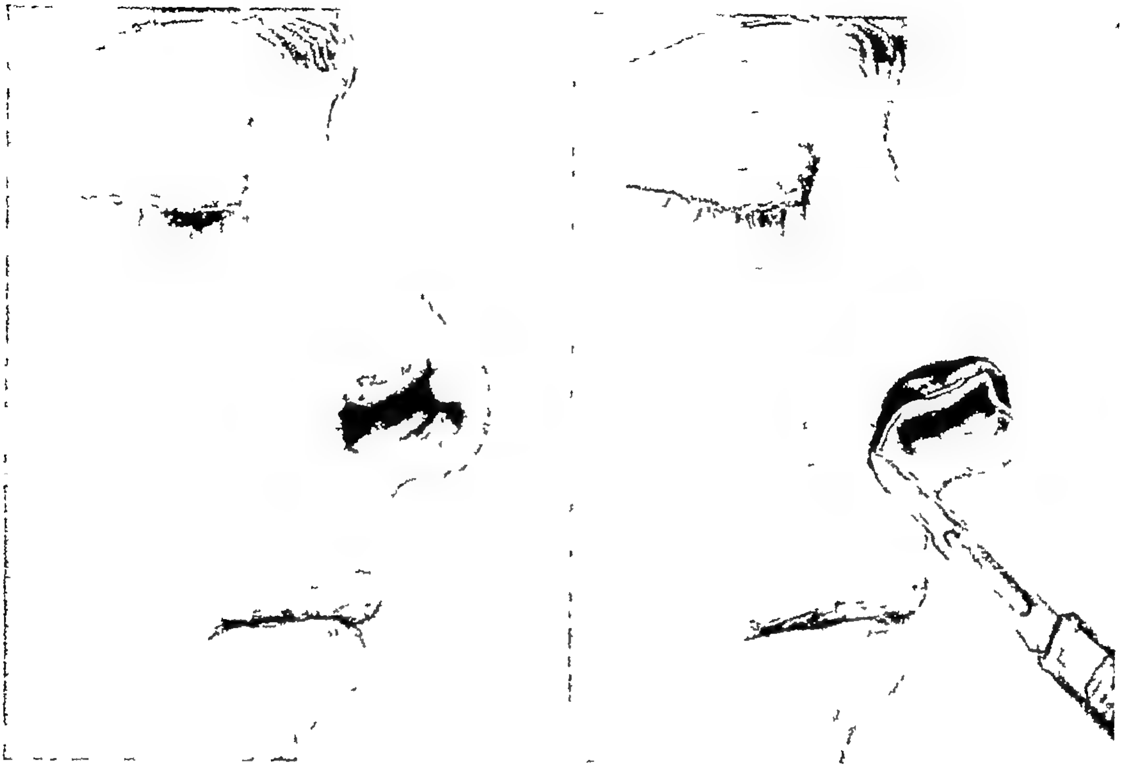

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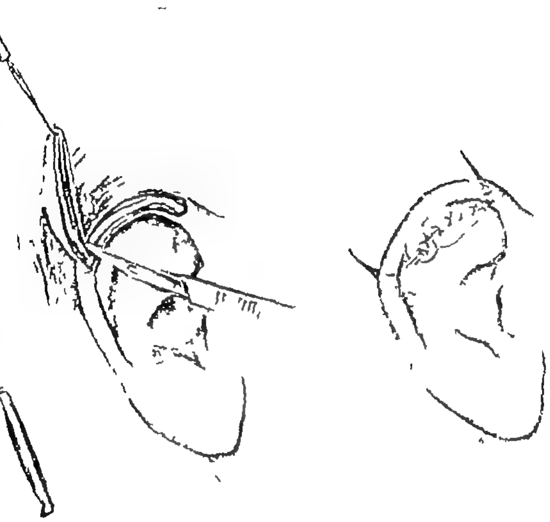
Free grafts from the ear lobe have been used for replacement of nostril bases, but they are inclined to be rather thick, flabby, and shapeless so that regular cartilage composite grafts are superior for repair of defects of the alar rims, tip, and columella The skeletal framework provides thin rims and clean-cut contours, as well as support where needed

These small losses about the ala, tip, and columella may seem trivial, but they are serious to the patient and difficult for the surgeon There could be no better proof than to cite the cumbersome distant flaps that were used in the past for these, in spite of the poor quality of the repairs so obtained



A *B*

Figure 279. *A* and *B*. Removal of full thickness composite graft of cartilage and two skin surfaces from ear. Care is taken to avoid separating either layer of skin from the cartilage. Left lower inset shows graft. Repair by burying raw edge of ear under postauricular flap is shown in *B* or by direct closure if from crus of helix.

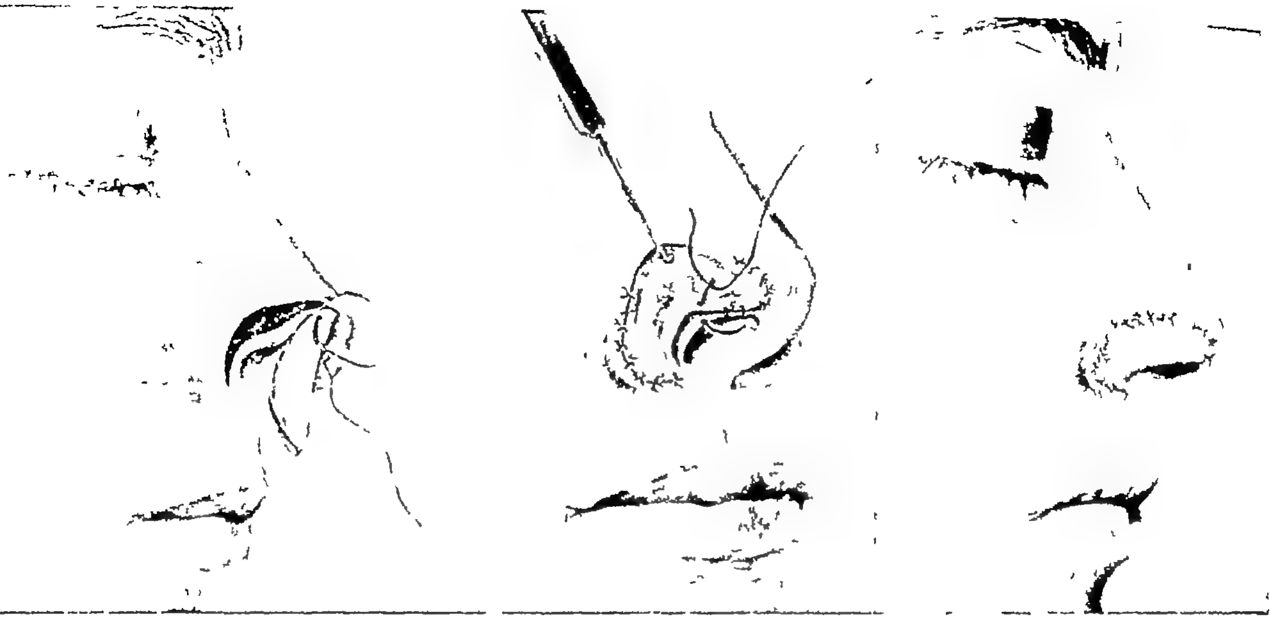


Figure 280 Composite graft, ear to nose Sewing the graft in place on the nose

Figure 281 Replacement of almost entire ala by composite graft from ear in one operation

Figure 283 Most of ala lost as a result of hemangioma in infancy Reconstruction of ala in two stages by wedge composite grafts, one from each ear

Figure 282. Profile and lower view of patient in preceding illustration Repair of donor area in crus of helix shown

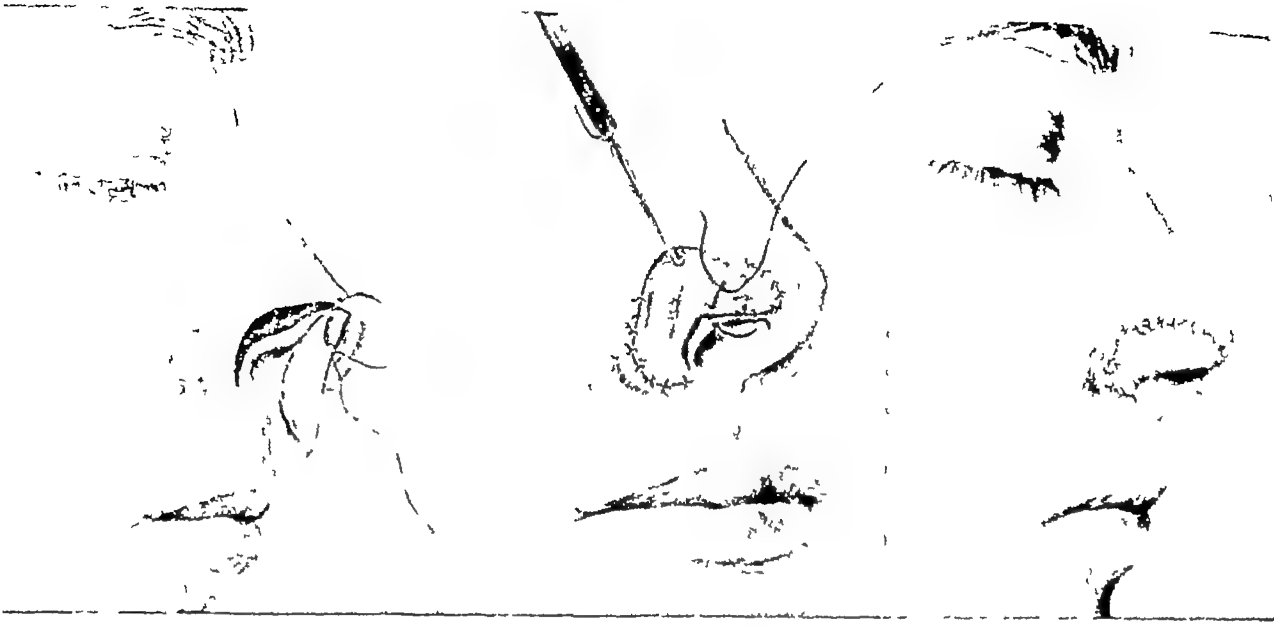


Figure 280 Composite graft, ear to nose Sewing the graft in place on the nose

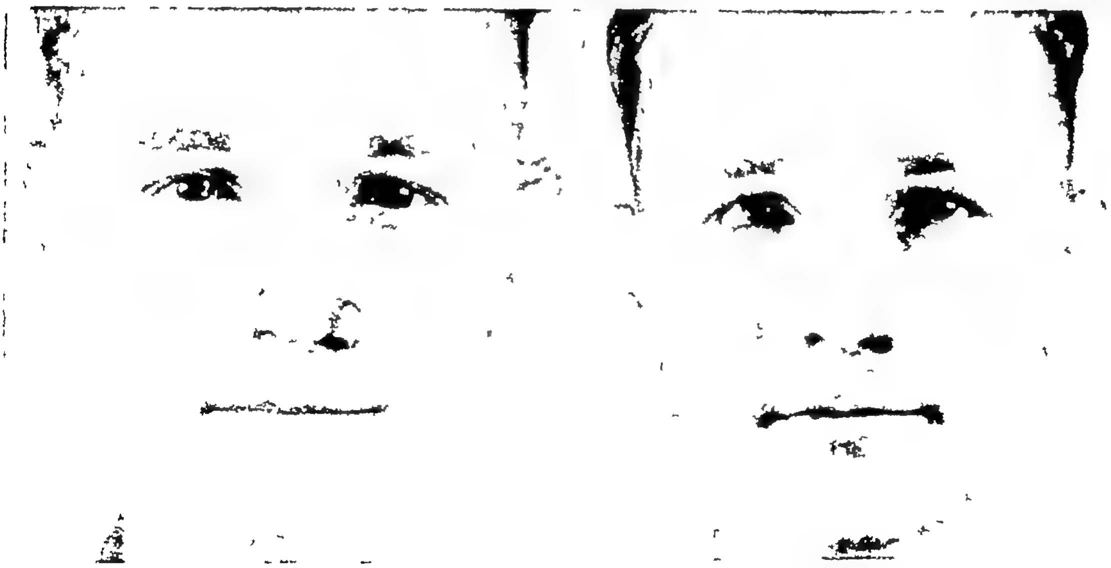
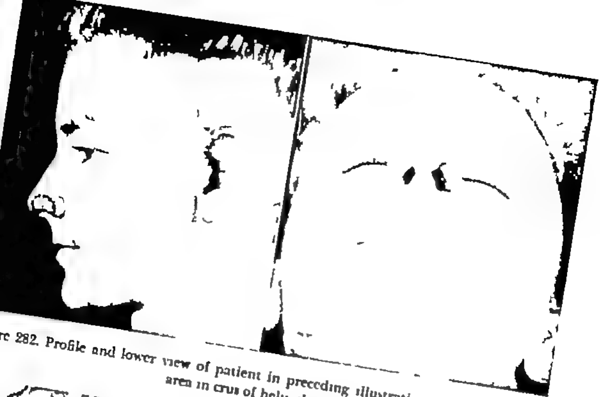


Figure 281 Replacement of almost entire ala by composite graft from ear in one operation

Figure 283 Most of ala lost as a result of hemangioma in infancy Reconstruction of ala in two stages by wedge composite grafts, one from each ear



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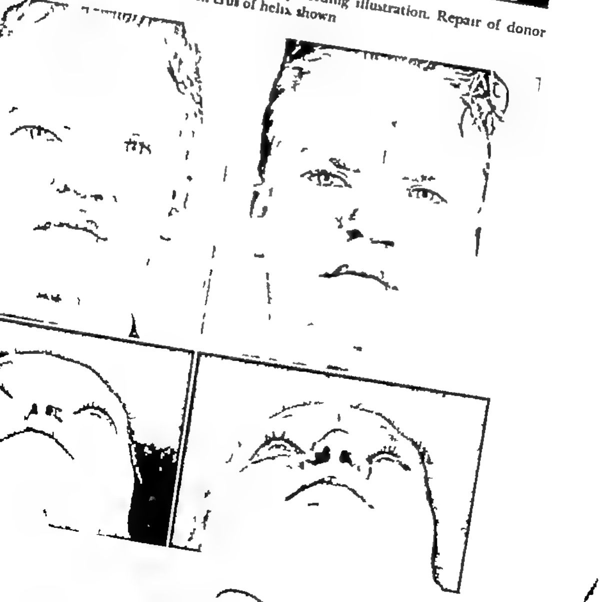


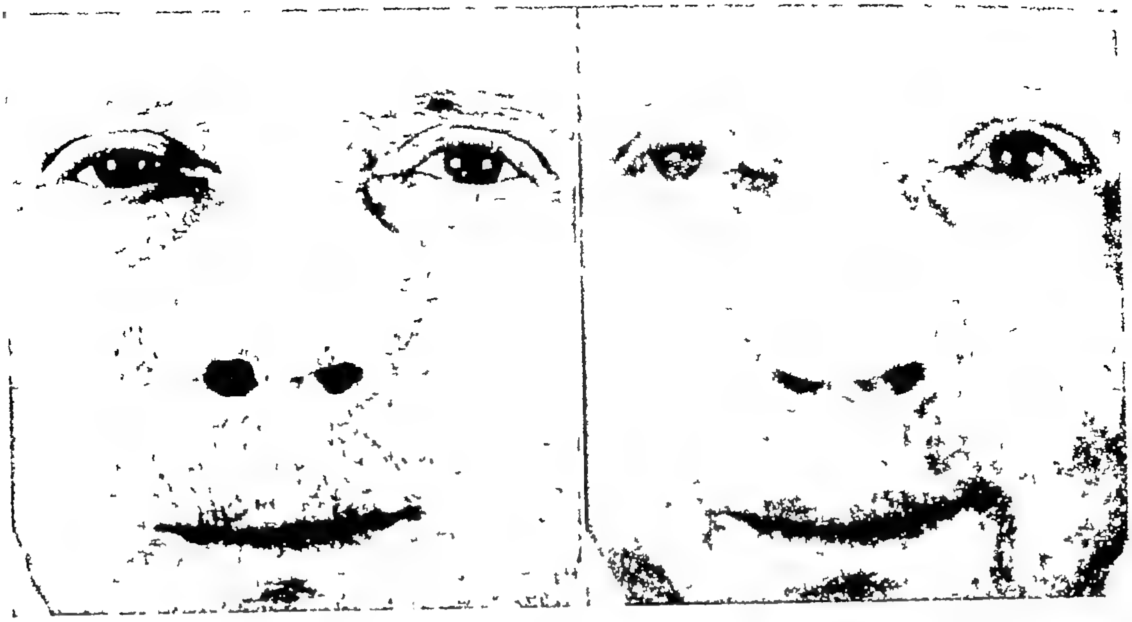


Figure 284 Nostril rim burned off Repair by composite graft, using burned ear

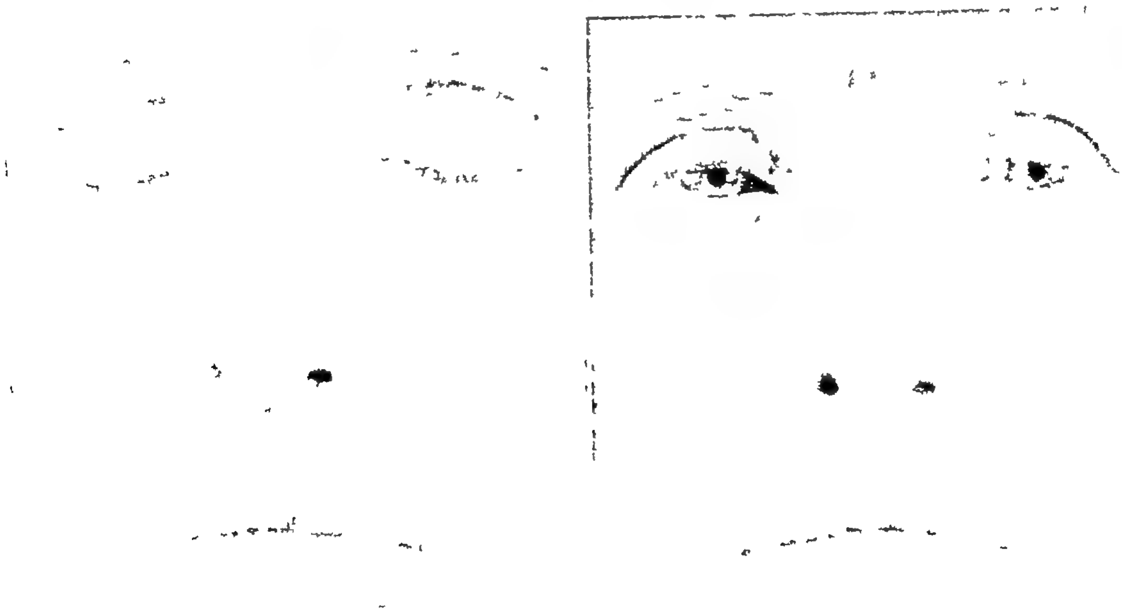


Figure 285 Basal-cell carcinoma of tip of nose Excision down to lining all around and immediate repair with flat composite graft

TECHNIQUE OF OPERATION

At operation, the defect is opened carefully, the edge scar discarded, and a good minute blood supply is opened into This increases the size of the defect and if the contracted tissues need opening they are dissected back into place (Fig 278) An accurate pattern is cut from celluloid

The pattern is marked out on the ear, choosing the area that provides the best contour and using the crus of the helix when possible, but the helix will

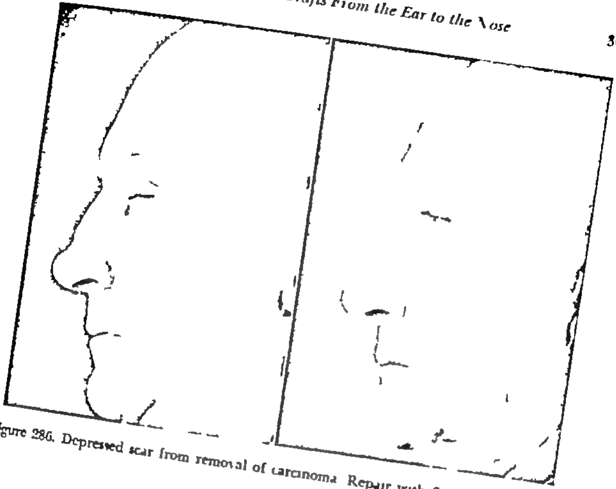
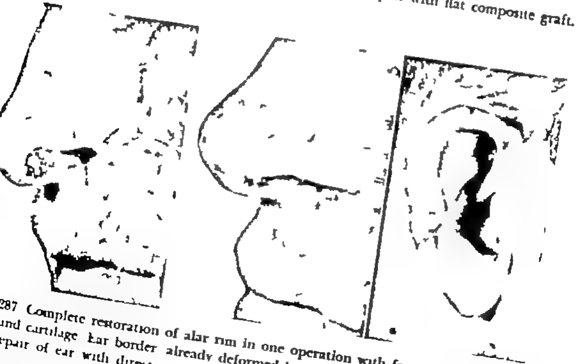


Figure 286. Depressed scar from removal of carcinoma Repair with flat composite graft.



287 Complete restoration of alar rim in one operation with free composite graft and cartilage Ear border already deformed by being shot through, used for ala repair of ear with direct postauricular flap. (From Brown and Cannon *Surg Gynec & Obst.*, 1946)

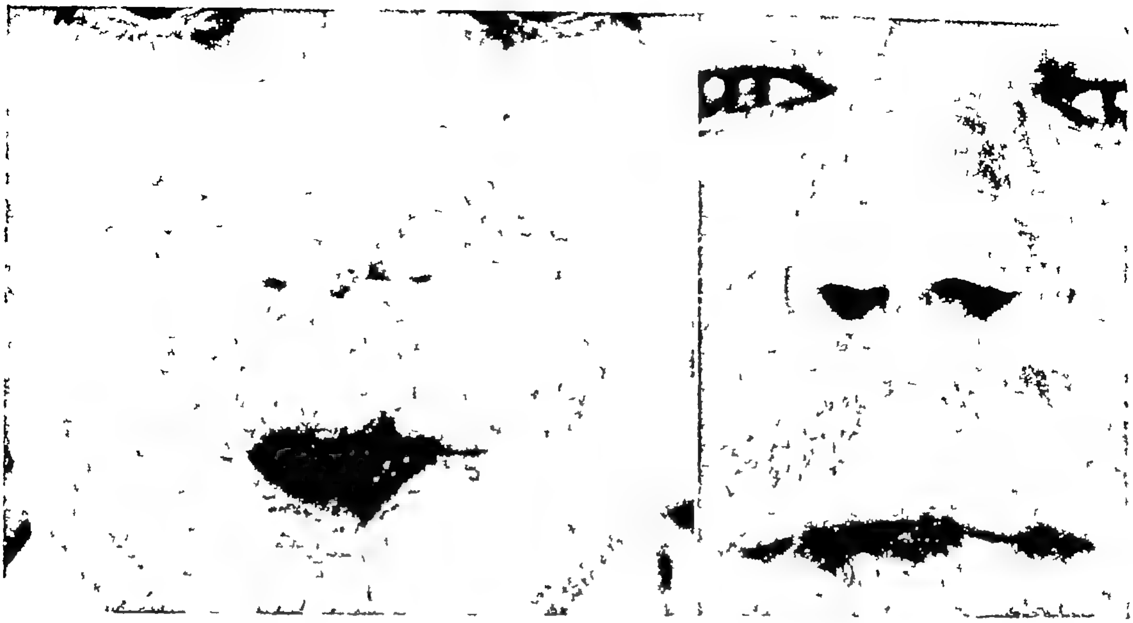


Figure 288 Restoration of columella, tip, and ala in a single operation by use of composite free graft of skin and cartilage Notching of lips has been corrected meanwhile (From Brown and Cannon *Surg, Gynec & Obst*, 1946)

flatten out sufficiently for rim replacement if needed The graft is removed by careful through-and-through incising, special care being taken not to dislodge the skin from the cartilage or to slide it off (Fig 279) The cartilage must be maintained as a composite part of the graft and not dislodged or loosened in its bed

The graft is sewed accurately into place with fine interrupted silk sutures, usually anchoring the ends first with deep fine silk, and then sewing all around the edges, inside and out (Fig 280)

The ear repair will vary somewhat according to the size and shape of the graft that has been removed For thin, long defects of the helix, the posterior skin is undermined down to the sulcus and beyond, and this skin is then moved forward until it will close the defect and form a roll at the helix A few through-and-through sutures will help in maintaining its new position, the new sulcus will be slightly more shallow, but not noticeably so, and this method completes the ear repair immediately

For larger defects of the helix, an opening incision is made in the postauricular skin, and the raw edge of the ear buried in it (Fig 279) After about two weeks, the ear can be taken loose with enough new skin attached to it to roll into shape for a new helix The postauricular defect can usually be closed by undermining and suturing, or with a split graft

When a wedge has been removed, the defect is closed by relieving the remaining cartilaginous spring, and sewing the edges together. The spring is broken by undermining the anterior and posterior skin past the apex of

the wedge and dividing the cartilage until the edges will come together without tension

Defects around the crus of the helix may be closed by any one or a combination of these procedures that seems most suited.

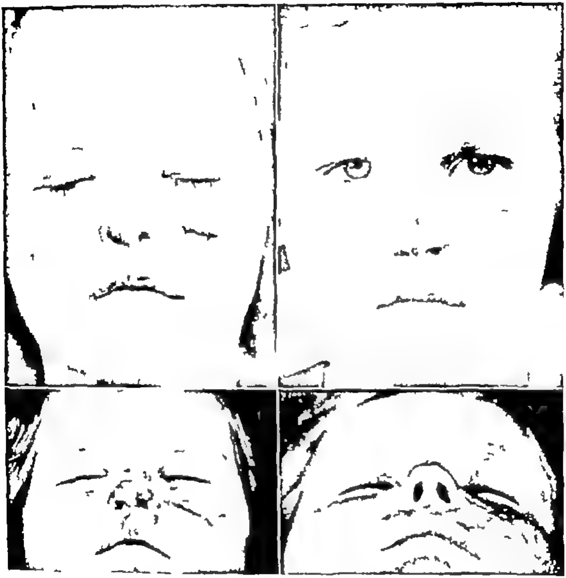


Figure 289 Repair of traumatic losses of nostrils, columella and tip with free composite graft.

DRESSINGS AND POSTOPERATIVE REPAIR

The graft on the nose is covered with a single layer of fine mesh grease gauze inside and out, and the nostril is packed firmly but not overdistended with iodoform gauze or surgeons cotton waste A careful external pressure dressing is applied with an aluminum splint molded over a gauze pad. Pressure is obtained over the lower surface of the nose with surgical waste or a small gauze pad with multiple straps of adhesive

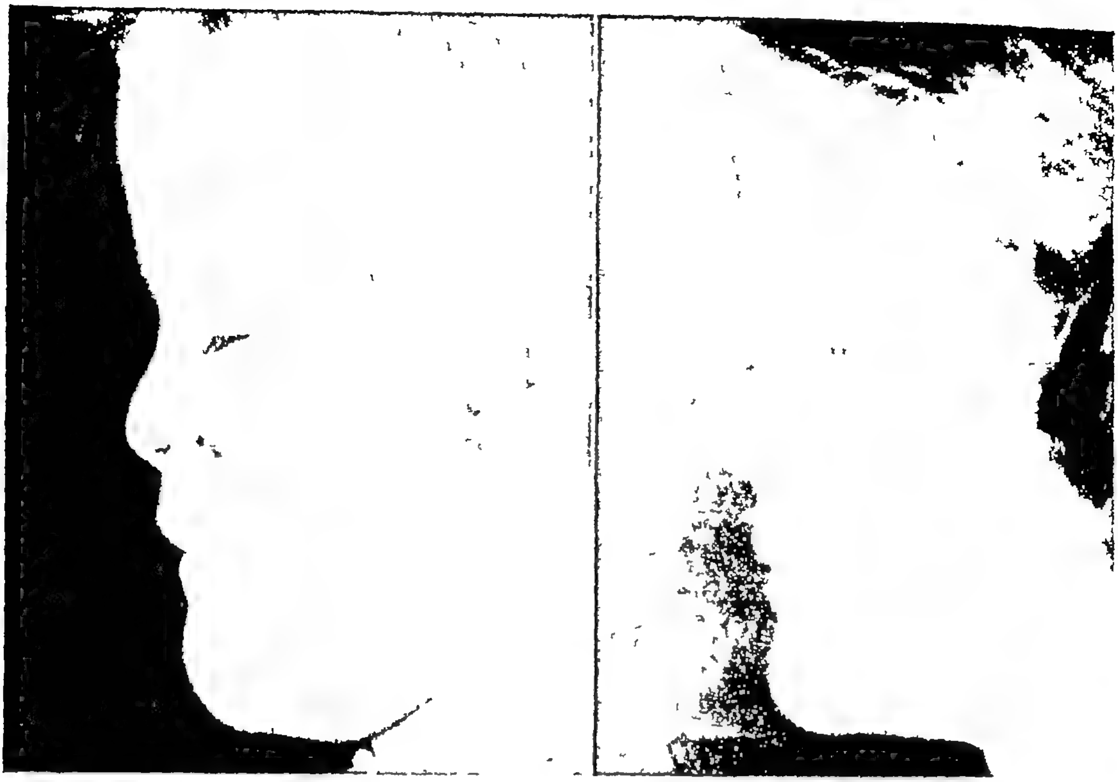


Figure 290 Profile views of preceding patient before and after repair with composite graft Flaps were avoided, and a better repair was obtained by this procedure

The first dressing is done in four days, the nose being cleaned inside and out, and the same type of dressing reapplied At the first dressing the graft may be quite pink or slightly cyanotic, but the survival rate is consistently good and continuous attention to details usually ends in success The sutures are usually removed about the tenth day and the dressing may be left off a few days later The color of the graft is red for a good while, but generally bleaches out enough for a satisfactory match in time, unless the patient's complexion is very pale

For an ear, fine mesh grease gauze is laid over all suture lines and a pressure dressing applied with surgical waste and a bandage Sutures are removed in about ten days

Any surgeon who learns to use these composite grafts will find that they produce better repairs of the difficult small areas with less residual donor deformity than any other method

Further experiences with composite grafts are described in Chapter XXV on Cancer, and Chapter XXVIII on War Injuries of the Nose

Chapter XX

RECONSTRUCTION OF WHOLE NOSE AND OF PARTIAL LOSSES WITH FLAPS

When a large defect of the nose is present the only possible repair is by means of a pedicle flap Such flaps are not necessary however for small repairs or resurfacing and examples have been seen where long flaps have been tediously raised for small defects that could have been better repaired in a single operation by a free composite or full thickness graft.

The flaps most commonly used are those from the forehead cheek neck and arm In each instance it is necessary to design and measure out the flap ahead of time (allowing enough for shrinkage) and then to execute its transference in as few steps and as expeditiously as possible. In general it is best to get the flap from as near the nose as possible (The arm however can be brought up to the nose) Various tedious uncertain procedures have been devised in the past for these repairs These include long tubed flaps from the chest abdomen or back caterpillar flaps (tubed flaps which are turned end over end in stages to migrate up to the nose) and jump flaps (tubed flaps from the abdomen to the wrist and thence in stages to the nose) It is well to avoid these

FOREHEAD FLAPS

The best total or very large nasal reconstructions are done with fore head flaps (Figs 291 to 300) This skin produces an excellent color match carries its blood supply well as a thin flap and has an inherent resiliency that will form a much better nose than softer tissue It has the single dis advantage of leaving scars on the forehead but these often can be made in visible except on close inspection

The most useful flap is one consisting of the entire lateral half of the forehead but with the pedicle based on the opposite supraorbital artery (Fig 292) and it is routinely used for most of these repairs.

For an entire nose the patient must have a forehead that measures at least 7 cm from the lateral end of the eyebrow up to the hairline directly above Better noses can be made in men with an 8 or 9 cm forehead and the possibilities are even greater if the patient is partially bald In women 5 cm may have to suffice as scalp hair should not be included in the flap

The lower incision for the flap extends from the medial end of the oppo site eyebrow straight laterally just over the eyebrow and then onward out to the temporal hair line The upper incision begins over the middle of the

opposite brow, extends upward in a gradual curve to the hairline in the middle of the forehead, then on over laterally just beneath the scalp line to the temporal hairline The end of the flap is a vertical line just in front of the temporal hair.

At the first operation, the upper and lower incisions are made, and the area between them undermined, staying just superficial to the periosteum in the central part of the forehead, and on top of the temporal fascia laterally Care is taken to keep the pedicle thick After hemostasis, the incisions are carefully closed with deep fine silk sutures and sterile adhesive on the surface, and a pressure dressing is applied However, if a skin graft is to be used for lining, it may be inserted at this time

Figure 291 Complete Indian rhinoplasty *Left,* The best shape for a total nose flap is shown, with the pedicle based on the supraorbital artery Clamp inserted under full thickness graft which lines mid-section of flap *Center,* Flap on nose with external aluminum splint to mold it *Right,* Final result with split skin graft on forehead

The second operation is usually done about ten days later, under local anesthesia, cutting across the lateral end of the flap and sewing it up again

At the third operation, the incisions are reopened with a scalpel, and the flap is carefully raised by blunt dissection all the way out to the pedicle It is examined for a few minutes to be certain that the blood supply is satisfactory for transference, as evidenced by good color throughout, no lines of demarcation, and bleeding from the end

If an entire nose is to be made, any remnants of skin left are dissected up as little flaps and turned down for lining and anchored with a few sutures Otherwise, it is necessary to have a skin graft lining for the upper two thirds of the nose

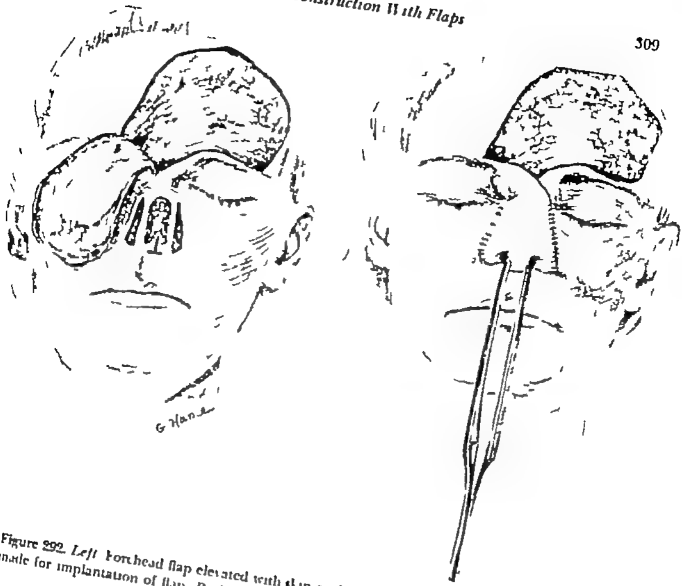


Figure 292. *Left* Forehead flap elevated with skin graft lining mid-section Nasal incisions made for implantation of flap *Right* Folding in the bottom of the flap to make the columella and line the nostrils.

The locations of the base of the new columella and the new alar bases are carefully determined and marked out with methylene blue The lines for the lateral edges of the new nose are similarly marked out and the whole pattern on the face studied for symmetry It is essential that there be no scar pull from adjacent areas on these opening incisions as the new nose will be susceptible to distortion from any such pull

The opening incisions in the nasal area are made and dissected apart enough to allow entry for the new nose The opening for the base of the columella may be made in the shape of an H with small flaps turned up for anchorage of the new columella

The flap is then brought down onto the nose With a thumb forceps the middle of the end of the flap can be folded together and then the whole end

of the flap turned in to simulate nostrils and columella This turned in lower end will line the lower one-third of the nose, and must be sufficient in amount to meet other lining above

As soon as these points are determined, the new nostril bases are sutured into position, inside and out A vertical incision may be made in the new columellar-alar angle of the flap to allow part of the flap to form the side of the columella and the remainder to go up to line the nostril The base of the columella is then sutured securely into place, and if there is any septal remnant left, it may be possible to fasten the new columella to it One or two loose lateral mattress sutures through the new columella may be risked to shape it, but care must be taken that the blood supply of the base is not impaired

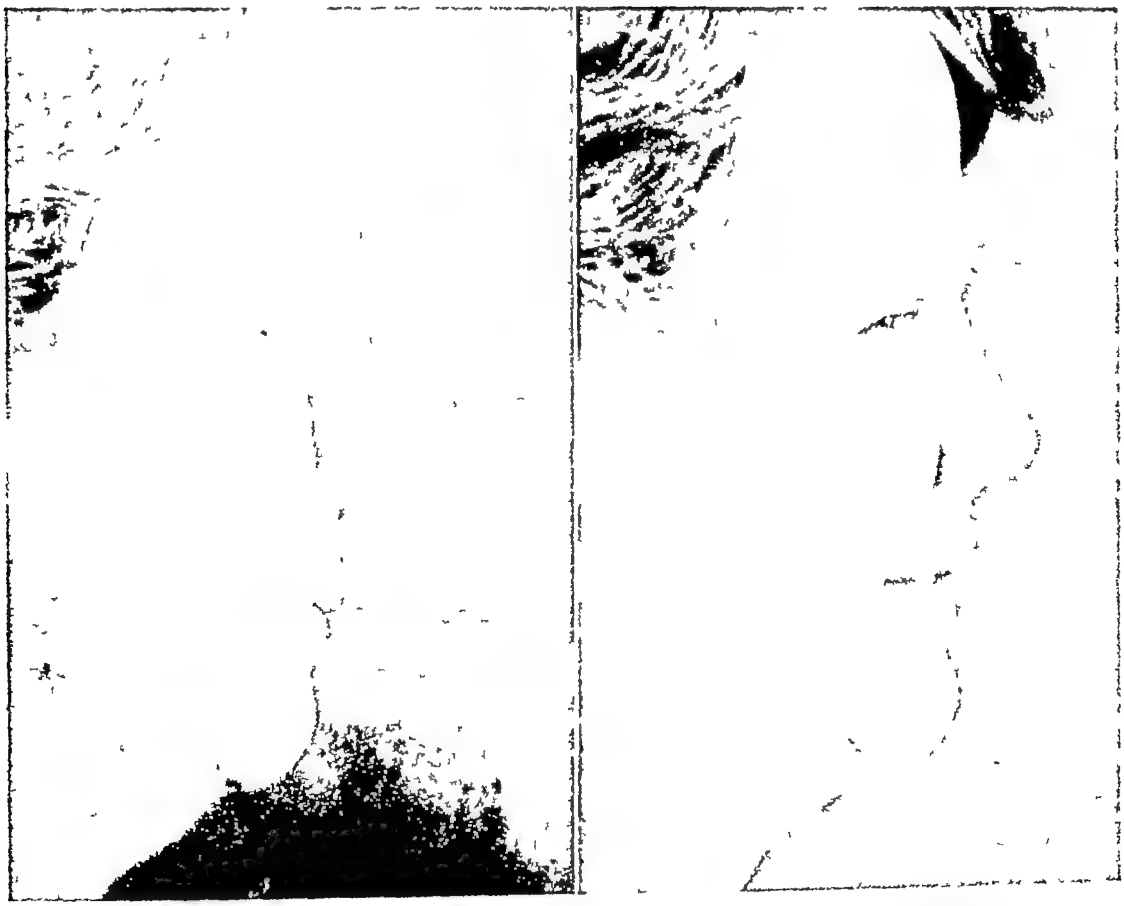


Figure 293 Profile views of patient shown in Figures 291 and 292.

All of this work in shaping the new nostrils and columella is facilitated if the lower inch of the forehead flap was made thin when it was raised originally

The lateral borders of the new nose are secured in place with fine interrupted sutures, approximating deep tissues as well as skin in order to bring

Figure 294 Total nasal reconstruction from a shallow forehead which makes a rather small nose

Figure 295 Nose burned off and extensive scarring of face Nose made from forehead flap. Split skin grafts to all four eyelids, both cheeks, upper lip and forehead. Eyebrows made from free scalp grafts.

in as much new blood supply as possible. Further up on the nose it will be found that the flap will be too wide and it is permissible to trim some off on one edge, so that one entire lateral edge and about two-thirds of the other lateral edge can be sutured in permanent positions. This trimming should not narrow the flap more than about one centimeter, however, because of possible danger to the blood supply lower down.

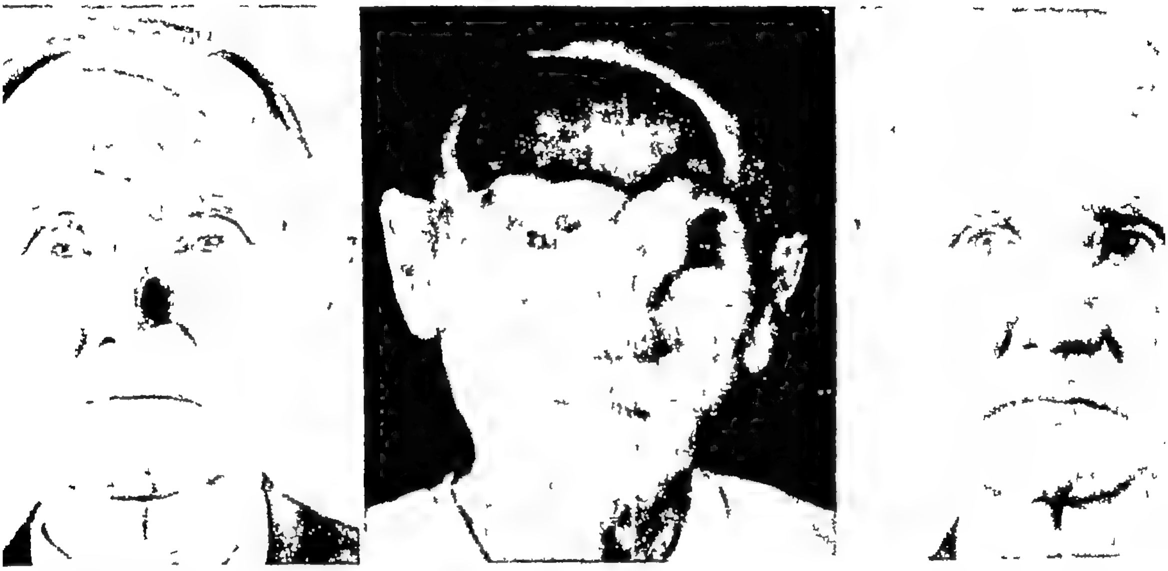


Figure 296. Defect involving almost entire lateral half of nose, from removal of carcinoma. Repair with forehead flap.

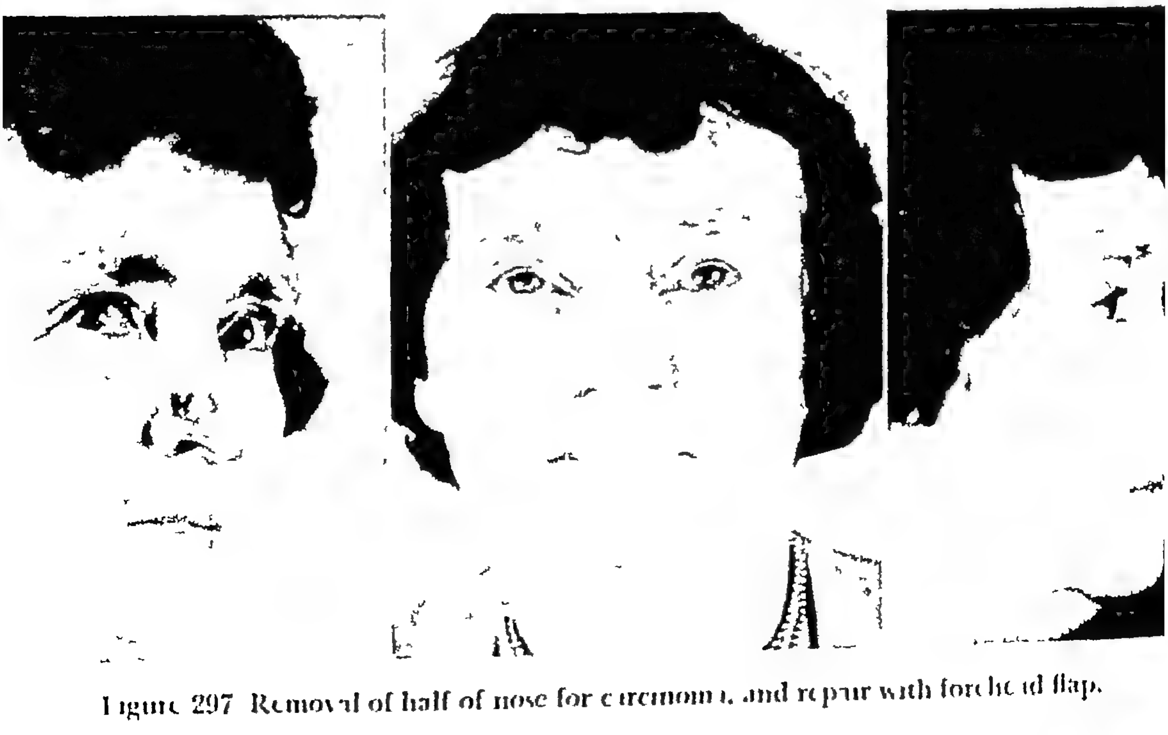


Figure 297. Removal of half of nose for carcinoma, and repair with forehead flap.

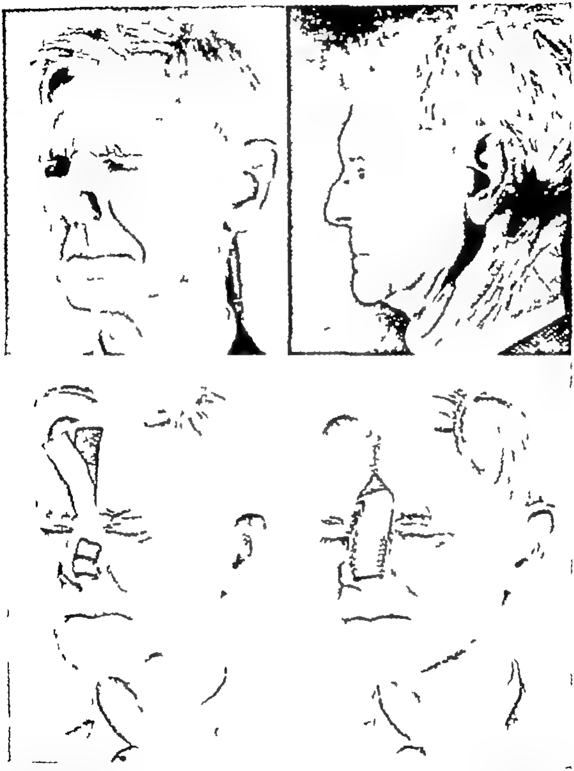


Figure 208 Removal of over half of one side of nose and repair with midline forehead flap These small flaps are better for repair of defects of the upper part of the nose however

One or two fine lateral mattress sutures can be used to tack the nostri lining and covering together, if they do not seem to impair the blood su ply of the rim or lining The nostrils are then loosely packed with iodofor gauze, and a fine mesh grease pressure dressing is applied to the forehea defect, care being taken to exert no pressure over the pedicle of the flap A external aluminum splint, of the forehead type (Fig. 161), is used for fin shaping, protection, and immobilization of the new nose

The packs are changed and the inside of the nose cleaned out every da or two On about the fifth day, the forehead is dressed for the first time, an then every day or two after that to maintain clean granulations Most of th external nose sutures are removed in four or five days At the end of tw weeks, the pedicle of the flap may be compressed for fifteen or twenty mi utes to test whether or not the nose has obtained a satisfactory blood supp from the face

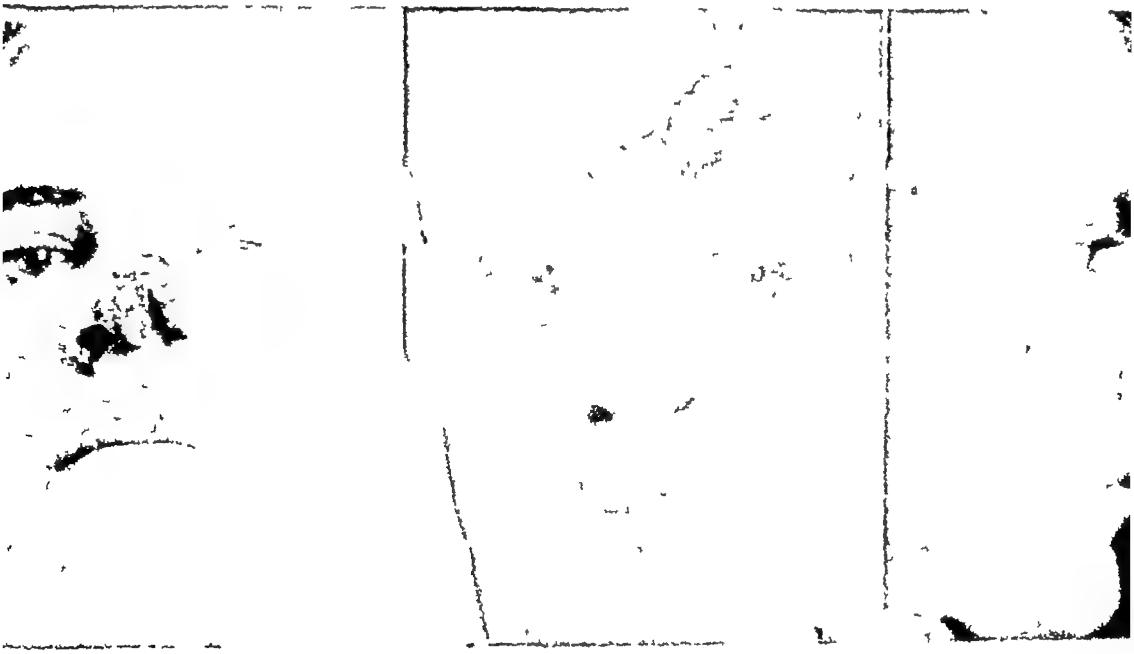


Figure 299 Repair of large nasal tip loss with a forehead flap Very early result shown

At the fourth operation, the pedicle is divided at the top of the new nos and returned to the forehead Any blue scar epithelium around the edges o the forehead defect is sharply excised, and granulations and scar tissue a excised from the undersurface of the pedicle until it lies perfectly flat on th forehead After the pedicle is sutured back in place, the remainder of th forehead defect is covered with a split skin graft and a pressure dressin applied.

Some later trimming or adjustments may be necessary, but one of th advantages of forehead flap noses is that nearly all of the shaping can b

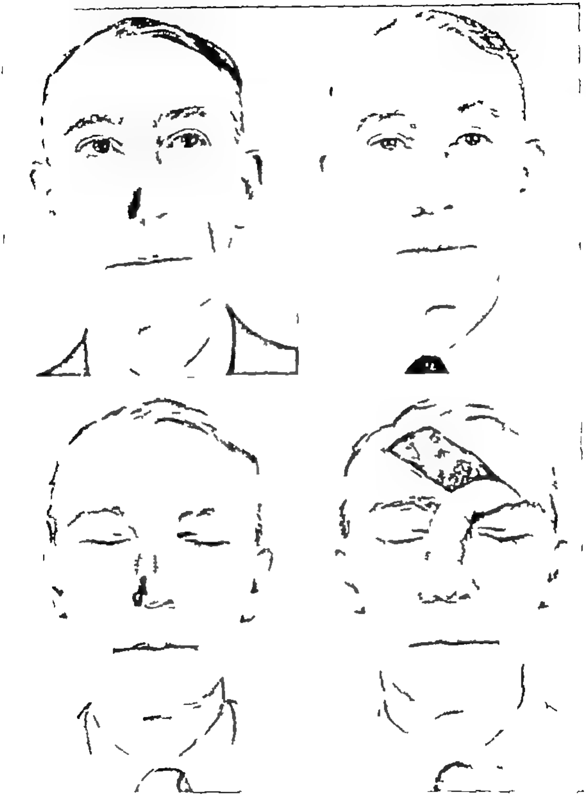


Figure 300. Forehead flap repair of almost half of one side of nose. Alternative method would have been by use of cheek flap.

done when the flap is first put down, and there is very little shrinkage or further distortion if it is properly lined If the septal support is gone some further improvement can be obtained by implanting an L-shaped piece of preserved cartilage after a few weeks The new nose will be swollen for a short while and will require about one year to settle down to its permanent status, but it is surprising how well it looks almost immediately

Large partial defects of the nose are repaired in much the same manner revising the operations in each instance to fit the defect at hand (Figs 299 and 300) It is usually best to have the pedicle of the forehead flap over the eye-brow opposite from the side of the nasal defect

Various other shapes have been used in forehead flaps A vertical midline flap can be rotated 180° for small repairs, particularly on the upper dorsum (Fig 299) A rectangular flap with the pedicle based laterally on the anterior branch of the superficial temporal artery will have an excellent blood supply and can often be moved down directly at the same time that it is first raised However, a flap in this position, and with thicker tissue at the end is difficult to shape into a good nose

LINING RECONSTRUCTED NOSES

Much of the shrinkage, distortion, and blockage of airways encountered in the past in reconstructed noses was due to lack of adequate lining for these noses They must be lined without any raw areas inside

The lower third of the new nose can be lined by turning the lower end of the flap under, whether it comes from the forehead, cheek, or arm If there are some sidewall remnants in the upper part of the old nose, it is best to turn skin flaps medially from them for lining, and construct the outside of the new nose completely flush with the face If there is an upper dorsal remnant left, the skin from it can similarly be turned down as a small flap to line the midsection of the new nose In all of these instances, it may be preferable to delay these little flaps at the same time the large flap for reconstruction is delayed Stumps of alar bases are excised so that the new nostril bases can be fitted flush into the face

When no remnants are available for lining, the upper two thirds of the nose must be lined by skin graft This graft is inserted under the reconstruction flap at the time it is first raised, using a full thickness graft, or a thick split graft There will be some shrinka

ARM

An arm flap repair has the consi ... tional facial scarring, but is likely to be ex ... tanned but lacking in red tones in co ... advantage when mo ... ha

Figure 301 Arm flap repair in a young person. When loss and surrounding scarring involve most of nose a better repair can be made by covering the entire nose rather than just the major portion. Patient cared for at Valley Forge Hospital.

this flap is most useful in these instances and in repair of large partial defects This flap is also best used in patients with white or lightly tanned faces without a ruddy complexion

The position of the arm to the nose is likely to be quite uncomfortable, particularly during the first few days, and may be almost unbearable in an older patient who may have arthritic changes present in the shoulder Most younger patients tolerate the position fairly well (Figs 301 and 302), but this point should be discussed with the patient beforehand, and the surgeon must decide whether the patient is mentally prepared to go through with it

Figure 302 Arm flap restoration of almost half of nose in a young patient

With the patient sitting up, the arm is placed against the nose with the forearm resting on the scalp, and various positions are tried until the most comfortable one is found The head is rotated toward the arm, and, obviously, in unilateral nasal defects, the arm on the same side is used A retrograde flap (with the pedicle toward the elbow) is then designed on the inner surface of the arm and marked out with methylene blue Arm flaps are likely to shrink from one-third to one-half in size finally, so that it is necessary to allow sufficient excess, usually making them 11 to 14 cm wide

At the first operation, the lateral borders of the arm flap are incised down to the fascia over the biceps muscle, and undermining is carried out in this

plane under the whole flap area After obtaining hemostasis the wound is sutured and a pressure dressing applied If it is necessary to line the flap with a graft it is done at this time also any little flaps from nasal remnants that are to be used for lining may be delayed at this time The upper end is cut across and sutured about one week later and after another week or two the flap may be transferred

The multiple delays are the safest possible way when transferring a large long rectangular flap However if the repair is to be smaller some stages can be omitted or if the repair can be done with a semicircular flap (with the diameter for the base) the flap can be applied directly without preliminary raising operations

At the operation for transference it may be best to raise the entire arm flap under light pentothal anesthesia The patient is then allowed to awaken and the work is completed under local anesthesia in the face At this time only the upper and lateral borders of the new nose are sutured into place A split graft may be placed over the raw area on the arm for cleanliness and comfort or it may be dressed with fine mesh grease gauze With the patient sitting up the arm forearm and head are adjusted to the most comfortable position in which there is no tension and little torsion on the pedicle The forearm is then firmly anchored to the head with a large strip of adhesive (using some padding between the forearm and head of course) A single large strip of adhesive coming from the back of the head under the opposite ear along the lower jaw line and then over to the upper arm and shoulder will help keep the head rotated toward the arm during the first few days This will require frequent changing after meals

The patient may be allowed up and around almost immediately The wounds are cleansed and dressed as necessary and the skin sutures are removed in about five days if the healing is rapid

At the end of two weeks or a little more the pedicle of the arm flap is compressed for fifteen or twenty minutes to see if the new nose has attained sufficient circulation from the face. If there is any question it is better to wait or to divide the pedicle in stages on two or three successive days The pedicle should be divided about 1½ to 2 inches below the nostril rim to leave enough to turn in for lining and allow for shrinkage

After dividing the pedicle it is best to leave the excess portion of the new nose hanging for a week or two dressing it over on one cheek to keep it out of the way The arm pedicle may be sutured back in place immediately and any remaining raw area on the arm may be covered with a split skin graft.

After the new nose seems established and the initial edema has subsided somewhat the hanging end may be thinned and turned up and in to form the nostrils and columella in the same manner as described for forehead flaps. However when an arm flap is used to form both lining and covering

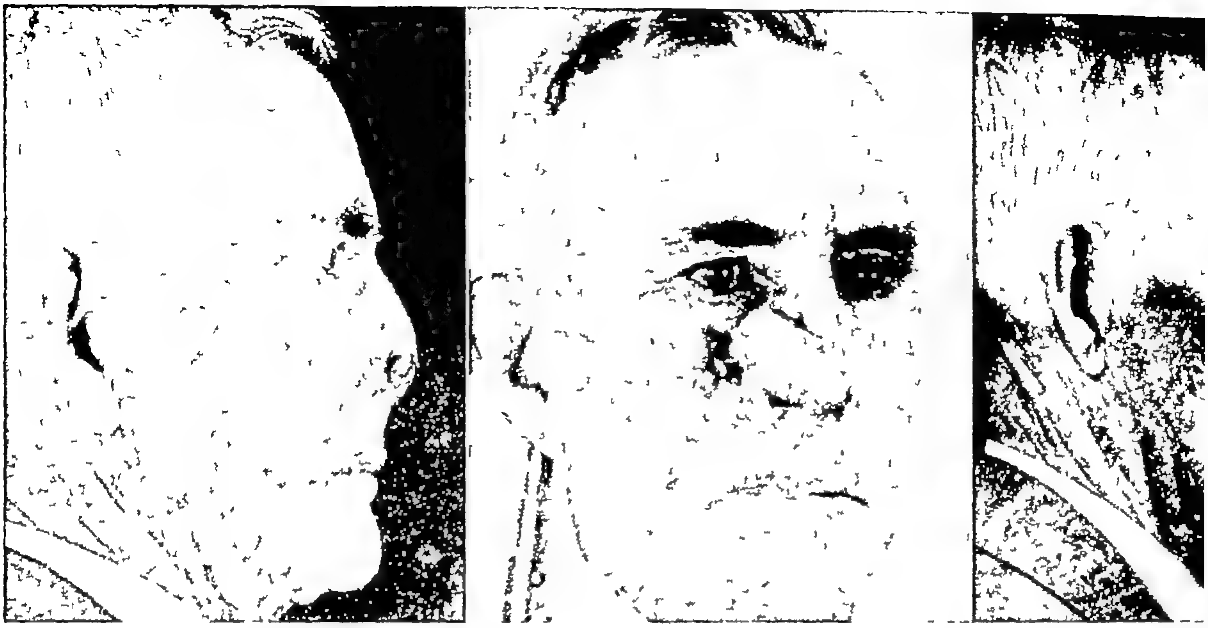


Figure 303 Defect too large for use of composite graft Repaired by use of cheek f
with part of flap turned under for lining

Figure 304 Restoration with cheek flap, turning in part for lining

of a nostril there will be more thickness and more secondary thinning will be required than in the case of a forehead flap

NECK FLAPS

Neck flaps have the disadvantages of softness and flabbiness seen in arm flaps and also produce additional scars in visible areas near the face there

Figure 305 Elongation of nose by cross section pulling lower part down and insertion of forehead flap across defect Repair by associate Dr Minot P Freyr

fore they are seldom used However, there are unusual occasions when the forehead or arm is not available, and the defect may be too large for a cheek flap repair

The flap is commonly raised in stages as a tubed flap, with the pedicle in the mastoid region, and the area to be transferred coming from the clavicular region near the midline After suitable delays, the flap is transferred to the nose, it is anchored to the lateral and superior edges of the defect first in the same manner as an arm flap Subsequent stages are the same as for an arm flap

CHEEK FLAPS

In older people with loose skin, cheek flaps are exceedingly useful for small defects which are nonetheless too large for repair with composite grafts

They can often be raised and transferred at the same time as direct flaps, but if the flap is to be very long or there is doubt about the blood supply, it may be best to delay it once Part of the cheek defect can sometimes be closed by undermining and suturing at the same time that the flap is transferred (Figs 303 and 304)

If the defect involves a nostril border, it is usually best just to attach the outside at the first operation and leave an excess to be turned under for lining at a later operation

Since these repairs involve smaller defects of many different shapes and locations, the exact design and modus operandi will vary a great deal with the ingenuity of the operator

FLAPS ACROSS MIDNOSE FOR ELONGATION

Noses which have become extremely short from destruction or collapse in the mid-section can be elongated by the insertion of a cross flap In order to do this, the nose is completely transected horizontally, the lower end pulled down into position, and a flap from the cheek or forehead inserted (Fig 305) Lining will be necessary and can be provided with a skin graft on the underside of the flap or by the use of a small local flap This operation was described by Joseph many years ago

Chapter XXI

COLUMELLAR REPAIRS

Columellar repairs is one of the most difficult and elusive objectives in plastic surgery. Several surgical procedures on the columella have been described in preceding chapters (Figs. 127, 136, and 254).

Hanging columella is corrected by a full thickness elliptical excision of the superior border as outlined in Chapter IX.

The hidden columella may be brought into view by shortening the lateral nostril walls as noted in Chapter IX, or by bringing the columella down with an L-shaped cartilage transplant as shown in Chapter XII.

The thick columella may be thinned by excision of the laterally curled portions of the vertical crures of the alar cartilages, together with removal of soft tissue between them as described in Chapter IX.

The slanting columella is straightened as outlined in Chapter XIII when due to a deviated septum; when caused by inequalities of the nostril floor or other soft tissue displacements, correction is as described in Chapter XV.

The short columella may be elongated by the operation illustrated in Chapter XVI, advancing a flap from the lower lip into it.

Partial absence of the columella may be repaired by the use of one or more composite grafts of skin and cartilage from the ear as shown in Figure 306. This operation is especially suitable for replacing one side of the columella (e.g., following excision of tumor), but can also be used for replacing a full thickness segment. In the latter instance, the composite graft will consist of cartilage with skin on just one side of it, and will be wrapped over in such a way as to have a double thickness of cartilage with skin on three of the outer sides. A free cartilage graft can be inserted later to give additional thickness, if necessary.

Total absence of the columella is usually the result of destruction by tumor or injury, so that it may be accompanied by loss of the tip of the nose or by loss of upper lip. In these instances, repair is best effected by a flap from the cheek, forehead, or arm (see Chapter XX), with secondary implantation of cartilage into the new columella.

If only the columella is absent, it is sometimes possible to construct a new one by using a flap from the central part of the upper lip (cf. Chapter XVI). Appropriate raw areas are created on the undersurface of the tip of the nose and on the upper part of the lip, and the tip of the nose is then sutured down to the lip in a preliminary operation. After a few weeks for the new blood supply to become established, the central flap may be taken

out of the lip and carried upward and forward to make a new columella in the same manner as elongation is done in secondary double cleft lip patients (Fig 307)

When this procedure is not feasible, various other flaps may be used The difficulty is that the columellar loss is so small that one hesitates to produce much scarring elsewhere on the face in order to repair it, an arm flap can be used, but such a columella is likely to look excessively white and flabby

Figure 306 Partial loss of columella and tip of nose repaired in one stage by free composite graft of skin and cartilage from ear

A small tubed flap can be raised in the fold between the lip and cheek (the buccolabial fold) After a few weeks' delay, it can be swung up into the columellar position in stages, and still later a cartilage transplant can be inserted into it This leaves only a single scar in the buccolabial fold which is scarcely visible and seems to be superior to the transverse lip flap described many years ago by Joseph (Fig 308)

Another plan that has been described consists of raising a small flap on the mucosal surface of the upper lip and inserting a small split skin graft under it to give it a kind of tubed shape At a later stage, the upper lip is turned up (wrong side out), and this flap is attached to the tip of the nose and then transplanted into the columellar position in stages This plan will work and will provide a columella at minimum cost, but the split skin graft covering it is likely to be wrinkled and off-color For this reason, it is then best to swing a flap up from the outer surface of the upper lip to resurface the new columella and add bulk to it The columella can then be brought down into view and made to support the tip of the nose by the addition of a costal cartilage implant (Figs 309 and 310)

Figure 307 Loss of columella repaired by sewing tip of nose down to upper lip and then advancing flap for mid-section of upper lip up into the new columella (as in Figure 254)

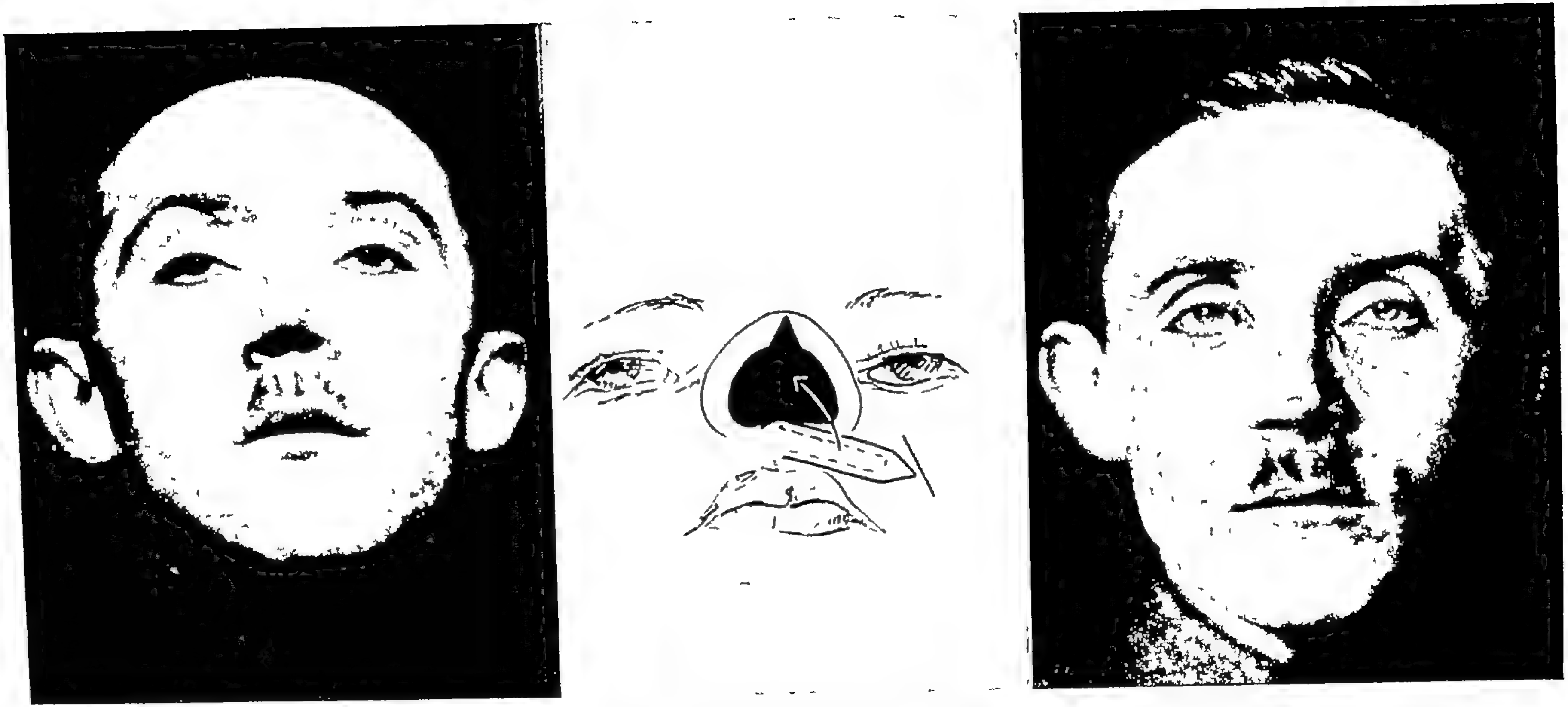


Figure 308 Implantation of bone peg into upper lip, then flap containing bone swung into columella (From Joseph)

Figure 309 Destruction of columella and part of nasal tip by hemangioma in infancy Free composite graft used for nasal tip restoration Flap from undersurface of upper lip covered with split skin graft swung up for new columella. This was then covered with flap from skin surface of upper lip and costal cartilage was implanted for support Small flaps from outside nostril bases swung into nostril floors.

Figure 310 Profile and lower views of patient shown in Figure 309

Another plan described by Joseph consists of swinging a flap 180° down out of the tip of the nose to form the new columella This can be used only when the patient has a wide tip, and the new columella will tend to be short or small because of the scarcity of tissue (Fig 311)

Another plan that can be used occasionally in partial losses involving the anterior half of the columella is to implant the remaining columellar stump into the ala on one side Enough of the ala can then be carried back to th

Figure 311 Flap swung from tip of nose down 180°, to make a rather short columell However, this could be elongated in the same manner as in double cleft lip patient (From Joseph)

Figure 312 Stump of columella sutured to alar rim Detached later to carry part of al over under tip of nose to form new anterior portion of columella Alar defect repaire with free composite graft Costal cartilage implanted into new columella to bring it dow into view

center as a flap to form the new anterior portion of the columella The alar defect may be repaired with a free composite graft from the ear (Fig 312)

In summary any plan that is used is likely to be tedious and require several stages and considerable improvisation Composite free grafts should be considered for partial losses Advancement of a flap from the central portion of the upper lip may be used for some losses. Total losses of the columella only may be repaired in this manner by a flap from the buccolabial fold or by a grafted flap from the undersurface of the lip Total losses of the columella combined with losses of the tip or upper lip may require larger flaps from the cheek forehead or arm

SECTION 6

VARIOUS OTHER NASAL REPAIRS

Chapter XXII

SECONDARY NASAL OPERATIONS

If the patient has had previous operations without achieving the desired correction this does not preclude further work but secondary procedures are always more difficult than primary ones. What was done in the primary operation may not be clear and the scarring and possible distortions from the primary operation make dissection and new positioning of the nose very difficult. Each operation increases these difficulties

The first step is to study the present condition of the nose and decide what further changes are needed for the desired correction Of secondary importance is the history of the original nasal deformity and the details of the original operations

The results will often not be as satisfactory as in primary operations and the patient should be warned of this. If the condition is nearly satisfactory one should be hesitant about undertaking refinements in noses on which previous operations have been done

Warped cartilage transplants will be seen occasionally and usually these are autogenous. Secondary correction consists of removing the warped cartilage and inserting an L-shaped preserved cartilage transplant (Fig 313) or other material that may be elected such as fresh autogenous bone Removal of the original transplant may be difficult, but is done with a small scissors and a septal elevator without penetrations of the skin or mucosa It is essential to obtain a base of bare bone with a chisel or saw and to dissect a large enough septal bed so that a new transplant of adequate size and stability can be inserted In these as in primary dorsal transplants the dorsal line is set in as a whole piece rather than allowing the transplant to end along the dorsal line which leaves a permanent unevenness. Care is taken not to get the transplant too high especially if the upper part does not need elevation

Floating dorsal struts of cartilage usually depress the tip rather than elevate it. The remedy is removal of the strut and insertion of a supporting L-shaped transplant (Fig 314)

Sunken or floppy noses following septal resections require restoration of support with a cartilage transplant as outlined in Chapter XII These are especially likely to occur if a resection which is too radical is combined with an osteoplastic procedure (Fig 315)

Floating chips of ivory bone, or cartilage usually become displaced later and create deformity They are seldom necessary and these noses can often

be improved by removing the chip and doing an osteoplastic operation to narrow and elevate the nose as outlined in Chapter XI (Fig 316)

Residual wide bony nose is usually due to incomplete in-fractures of the nasal bones, or failure to keep them splinted in together until solid union has occurred Correction consists of chiseling the bones loose from the nasal septum (or using a straight nasal saw as described in Chapter V), sawing through the frontal processes, and then securing complete, loose in-fractures If the latter cannot be obtained by manual pressure, or by levering outfractures first and then manual pressure inward, it may be necessary to make a little nick in the skin over the intact arch of bone and cut through it with a chisel After-care includes snug nasal splinting to hold the bones in for at least two weeks

Residual wide tips, remaining after previous incomplete tip cartilage operations, are corrected by mobilization of the tip cartilages, exposure by the eversion technique, and trimming to the desired shape (Fig 317) Numerous examples of these secondary corrections are shown in the chapters on reconstruction of the lower lateral cartilages

It is important to note that the bulk of skin may also account for thick tips, and that cartilage resections cannot correct deformities inherent in the skin

Figure 313 Warped autogenous cartilage transplant Secondary repair by removal and replacement with L-shaped preserved cartilage

Figure 314 Floating dorsal strut of cartilage which depressed tip rather than furnishing support. Secondary repair by removal of strut and replacement with L-shaped preserved cartilage

Residual twists in the nose are usually due to incomplete operations or to a septal resection and an attempt to fracture the nose back over into place Once the cartilages and bones have grown solid in a twisted position a complete operation as described in Chapter XIII is required (Fig 318)

Residual depressed noses, either in the upper dorsum or in the tip are the result of too much reduction at the primary operation Correction is obtained with an L shaped cartilage transplant (Fig 319) or by reoperation with adjustment of the skin and support if the depression is not too marked This is a deformity that has tempted some surgeons to use paraffin injections this is mentioned only to call attention to its danger and contraindication in any surgical service

Redundant thick skin is a common cause of residual deformities This may be tested for by picking up the skin between the fingers and feeling it before operation Thick sodden skin with large pores has little elasticity and does not readily shrink and conform to a new smaller framework Some surgeons refuse to operate upon any patient with thick skin but this extreme attitude is not always necessary as the inherent difficulties often can be circumvented and these patients may present good reasons for operation

from their viewpoint One method of avoiding trouble is not to make the cutdowns too large and to leave the dorsal line a little higher than average, though within normal limits

An apparent hump may be due to a hooked-down tip, in which case shortening of the nose, combined with removal of a little cartilage off the dorsum, may result in a straight line profile with a pleasing angle In others, the apparent hump may be associated with a normal dorsal line elevation but with loss of tip support In these, restoration of support with a cartilage transplant may straighten the profile better than any other adjustment that can be made, but the upper dorsum may have to be lowered to permit a full length transplant

Figure 315 Old depressed fracture in which septal resection had produced further collapse Secondary repair by insertion of L-shaped preserved cartilage for restoration of support and contour

Some patients are seen secondarily with a good nasal framework on palpation, but with a little bulge due to thick or loose skin over the dorsum At times, correction may be attempted by undermining the skin over the nose and on to the adjacent cheeks, and redistribution of the skin over the

framework. Excess fibrous tissue on the undersurface of the skin in the bulged area may be trimmed and there may be a little extra trimming of the framework just underneath it The skin is then firmly splinted down on the framework with adhesive strips and an external aluminum splint and held there, with changes of dressings every two days for two weeks.

Figure 316. Patient in whom a small perforated ivory plaque was inserted for buildup of dorsum plaque fractured from erosion and trauma Secondary repair by removal of ivory and osteoplastic procedure to narrow nose and simultaneously build up dorsum without using any transplant.

If the bulge of the redundant skin is larger secondary skin excision must be considered even though it will leave an external scar When the bulge is in the tip area or just above it the skin excision can be done at the nostril bases (as described in Chapter IX) and enough skin undermined between these areas and the bulge so that the slack can be taken up This procedure is not used generally but it will improve noses with redundant skin and its more frequent use will probably relieve many patients.

For very large thick skin bulges excision of an elipse of skin along the entire length of the dorsum may be required to produce correction The skin is closed with fine sutures which are removed early and the wound supported with sterile adhesive so that the resulting scar may be scarcely visible (Figs 320 and 321) This procedure should be considered from the begin

ning with certain of these patients with very thick skins and gross deformities, but fortunately does not have to be resorted to frequently

Postsurgical collapse of the tip may result from too much resection of the alar cartilages In this deformity, the nostrils appear small, feel flabby, may collapse completely on inspiration, but can be easily spread wide open with a speculum The soft tissues are normal, but the support is gone In minor degrees where the gap in the cartilaginous arch is small, it may be possible to restore continuity of the arch by mobilization and rotation or other local shifting of the segments If a larger amount of the support is missing, the

Figure 317 Large spongy nose with residual deformity after plastic operation elsewhere Secondary repair consisted of removal of large amount of subcutaneous tissue, removal of residual sump, reconstruction of alar cartilages, and excision of excess skin at nostril bases Shown early after operation while skin scar was still pink

only remedy is cartilage transplantation to bridge the defect. Occasionally it may be possible to secure a small piece of cartilage from elsewhere in the alars the upper laterals or the septum but care is taken not to produce another deformity in order to repair this one. Ear cartilage is the second choice and it may rarely be necessary to use a small carved plaque of rib cartilage

Postsurgical "pinched in or dented nostrils are the result of the resection of too much lining Due to internal scarring the nostril is small pinched in stiff and cannot be expanded to normal size Once established this deformity is difficult to correct At times undermining of the surrounding lining with local shifting and redistribution will be helpful in small defects. When the deficiency is greater excision of the scar and skin grafting may be necessary though skin grafts inside the nose are undesirable

Recurrent or residual humps are one of the most common and difficult of the secondary problems encountered Careful analysis of the cause in each patient is essential The common causes are (1) inadequate removal of the original skeletal hump (2) failure to lower the dorsal line sufficiently in a patient with a short columella (3) lack of tip support (4) redundant thick skin (5) a combination of some of these factors In any event the corrective measures are obvious once the correct diagnosis is made (Fig 322)

Figure 318. Old twisted fracture with tip slumped from septal resection Nose straightened and shortened. Remaining septum replaced in midline position and adequate in this instance for restoration of support.

Almost every nasal deformity known will be encountered in secondary operations, and their correction is described in the corresponding chapters, so that illustrations of patients who have had secondary corrective operations appear throughout this book

Figure 319 Loss of tip support by previous operation Secondary repair by insertion of L shaped cartilage transplant

In undertaking secondary operations, it is to be realized that the primary procedure will have depended on the surgical training and experience of the original operator Small humps may have been "rasped off" and nothing else done, leaving the side walls too wide and causing a truncated cone appearance These primary procedures have been combined with a routine excision of a septal wedge, so that as a result some of the noses may have been very short Nothing may have been done to the tip, or a small strip may have been cut out or punched out blindly on either side

These examples are not cited for criticism, as even the best operators will have occasional results which do not turn out as well as anticipated or de-

Figure 320 Giant nose with thick skin requiring excision of vertical ellipse of skin down the dorsum secondarily after complete primary osteoplastic operation.

Figure 321 Appearance after primary osteoplastic operation and after second skin excision.

sired, and which can be improved by secondary corrections However, it is hoped that this book will demonstrate the advantages of careful planning and complete surgical corrections in nasal surgery

Figure 322 Residual deformity after operation elsewhere, requiring secondary correction of all parts of nose

Chapter XXIII

THE NOSE IN RELATION TO THE UPPER LIP AND CHIN

PROPER BALANCE of the features is so important that consideration of it should become routine or almost automatic for the surgeon The patient may complain chiefly of the nose but correction of the upper lip or chin in some instances may help just as much or more

THE UPPER LIP

A long hooked nose may cover much of the upper lip and impart an unpleasant expression to the mouth which is most obvious when the patient wants to look his best in smiling Often reconstruction and shortening of the nose will allow a normal upper lip to be seen and result in a balanced pleasing expression to the mouth (Figs 323 and 324)

If the upper lip is retruded a little even slight excess length to the nose produces this appearance Correction in this instance consists of shortening the nose plus advancement of the upper lip as in secondary cleft lip operations. This is accomplished by freeing the upper lip and cheeks in the fornix from one molar region to the other and advancing mucosa and soft tissue forward and suturing it in this position It is particularly helpful to suture soft tissue from either side together in the nasal spine region to obtain more bulk to fill it out (Figs 325 and 326)

When the upper lip is markedly retruded with a long hooked nose the worst deformity of this kind results Together with nasal correction it is essential to get the lip forward (Fig 327) The lip can be loosened and advanced as described, but if there is not enough tissue to bring it forward a cross-lip flap may be a necessity (Fig 261) If there is enough soft tissue to allow the lip to come forward but collapse because of lack of dental support a dental prosthesis with incisor teeth set forward far enough may be of great help

Loss of the nasal spine may produce an acute nasolabial angle with a "sunken in" expression in this area At times some correction may be obtained as previously outlined However if septal support is lost the best correction will be the use of an L-shaped cartilage transplant in the nose with the vertical limb extending forward and well down into the lip (Fig 326)

A large nasal spine or an extended septum may produce so much webbing of the columellar region as to give the appearance of a very short upper

Figure 323 Improvement in mouth expression and appearance of upper lip from shortening and tilting up nose Unposed clearing of expression

Figure 324 Profiles of patient shown in Figure 323

lip. Excision of the prominent part of the spine and septum allows the web to sink in and settle down into a normal angle and give the impression of having lengthened the lip so there is the appearance of normal lip length (Fig. 67)

Figure 130 Advancement of upper lip and opening of columellar labial angle combined with shortening of nose and reconstruction of tip cartilages.

A huge nasal framework may pull the cheeks and upper lip forward so as to impart a slant backward to the lip border Cutting down the nose to normal size will often allow the lip tissues to settle back in position and result in the normal slant forward to the lip border (Fig 131)

THE RETRUDED CHIN

A very large nose with a retruded chin creates a "birdlike" appearance which is most objectionable to certain patients. If the chin is not too bad reduction of the nose may be sufficient to soften the expression The plans are worked out beforehand on a plaster cast and the nose is corrected first

The chin can be brought forward by a cartilage or bone graft by a bilateral osteotomy of the rami and slipping the whole lower jaw forward or by widening and deepening the lower labial sulcus with a split skin graft and inserting a dental prosthesis In most instances transplantation of preserved

Figure 326 Retruded nose and upper lip, with acute nasolabial angle, from old football injury Repair in two operations (1) Upper lip advanced, alar cartilages reconstructed airways cleared, and bulges trimmed out of nose (2) Nasal support restored with L shaped preserved cartilage transplant

cartilage in an adequate amount will be the most satisfactory (Figs 328, 329 and 330)

A transverse incision is made well under the chin, so that the scar will still be underneath when the chin is built out, and the dissection is carried up to the mandible The periosteum over the front of the mandible is split with a Joseph elevator and elevated over the area of the proposed transplant. Care is taken to protect the mental nerves at their exit from the mandible The fingers of one hand are placed in the labial sulces, to guide the elevator and prevent puncturing the oral mucosa at any point

The transplant is then prepared from long curved pieces of preserved rib cartilage From the clay model on the cast the dimensions of the transplant can be decided and how much it should protrude forward and how much downward The desired build-up of the chin may require two or even three thicknesses of cartilage These may be fastened together with through

and through fine silk or wire sutures. The combined pieces of cartilage are carved to shape and the edges beveled The transplant is then introduced under direct vision with as much direct application to bare bone as possible to obtain the firmest fixation The skin flap is pulled down over it and a decision made as to whether the transplant needs further trimming or adjustment.

Figure 327 Retruded upper lip made worse by large hooked nose and turned out lower lip (same patient as one shown in Figure 258) Repair by advancement of lip cutdown and shortening of nose

A more direct and simple preparation of the transplant is to start with a piece of cartilage fresh or preserved as close to the requirement as possible It is cut to the proper length from side to side and the ends are sliced down for an even take-off from the bone The whole bulk of a rib cartilage is nearly always needed in front but may require some trimming Then the fitting to the jaw which will be found difficult by carving alone is done by making vertical cuts across the outer surface about three fourths through and about 5 mm apart. This allows the cartilage to bend to the shape of the jaw and to fit most accurately with the closure of the skin flap If more bulk is needed then a similar but shorter piece is placed either over or under

Figure 328 Extreme micrognathia Improved by cutting down nose and building out chin with several layers of preserved costal cartilage

Figure 329 Retruded chin improved by large transplant of preserved costal cartilage Nasal skin very thick, this would require skin excision down the dorsum for maximum improvement

the arch of this piece at the chin according to how well the first piece approaches the bone

An important step is that the cartilage is anchored in place in two or more places with fine wire (No 5 Surgaloy) or silk sutures through the cartilage and the edge of the remaining periosteum

The subcutaneous tissues are closed with 000 silk and the skin with fine silk. Strips of sterile adhesive are stripped snugly across the wound above below and to either side of the transplant for further fixation Still further

Figure 350 Preserved cartilage transplant to chin and nose in one operation

pressure fixation is obtained with elastoplast over the whole area and up on the cheeks and pressure with surgical waste is applied and held with more elastoplast, or with a complete head dressing of gauze rolls

The skin sutures are removed in about five days and the transplant becomes fairly well fixed in ten days to two weeks.

Reports have been made of transplanting nasal humps to the chin but even the largest humps are too small to build out a chin very much An adequate build up requires a large amount of cartilage

Ramisection with extension of the chin forward to a desired position may be required but this is applied to degrees of micrognathia that are

entities in their own right and is mentioned here only in regard to balance of features

REDUCTION OF THE PROMINENT CHIN

The large hooked nose combined with the prognathic chin has been a favorite device for caricature for many years, but may be the source of much unhappiness for the individual so afflicted

Again, it is best to plan both operations on a plaster cast and to make the nasal correction first

Figure 331 Huge nose combined with prognathism, a deformity in which the nasal tip and chin come closer together with increasing age Complete change in appearance by osteoplastic cutdown of front of chin, and osteoplastic reduction of nose

The chin may be reduced by cutting bone off the front of it (Fig. 331), or by setting the entire jaw back (Fig 332) To make the decision, both the occlusion of the teeth and the contour of the mandible are studied. In addition to inspection and bimanual palpation, valuable information as to contour can be obtained by straight lateral laminagraphs of the jaw or by straight through flash x-rays to reveal the bone and the soft tissue shadow.

Both of these project the lateral half of the mandible in a straight plane and are useful in these studies whereas the conventional x ray which is tilted is of little value. The preparation of plaster casts of the dental arches and study of them on an articulator is desirable and an orthodontist or dentist skilled in the evaluation of occlusion will afford helpful suggestions

Figure 352. Retruded middle third of face combined with lumpy nose and prognathism of mandible Repair of rhinoplasty transplant of crossbar of cartilage behind lower end of nose and adjacent parts of cheeks, and setting lower jaw back by closed ramisection

If the mandible seems normal except for an extension of bone forward from the anterior surface removal of bone from the chin may be sufficient.

If the mandible is enlarged so the lower dental arch is in advance of the upper arch it is best to set the entire jaw backward There are several ways of doing this but closed bilateral osteotomy of the rami is best in most instances. Plaster casts of the dental arches may be prepared and the new occlusion determined beforehand in relation to the desired amount of setback

Dental arch bars can be used or interdental wiring can be done at operation Cast splints or other complicated apparatus are seldom necessary

Anesthesia is obtained by deep block of the second and third division of the fifth nerves. General anesthesia can be used but produces some hazards in maintaining the airways open with the teeth wired together until the patient is conscious and no longer vomiting When done under local anesthe

sia, the patient usually "drinks lunch," is up and about the room that afternoon, and may be discharged from the hospital in a day or two.

At operation, it is helpful to outline the borders of the ramus, condyle, coronoid, sigmoid notch, angle and posterior part of the body of the mandible on the external skin with methylene blue. The plane of transection is then determined, usually about 1 cm below the sigmoid notch. A small puncture opening is then made in this plane about 1 cm in front of the ramus and another one the same distance behind (the latter is usually just

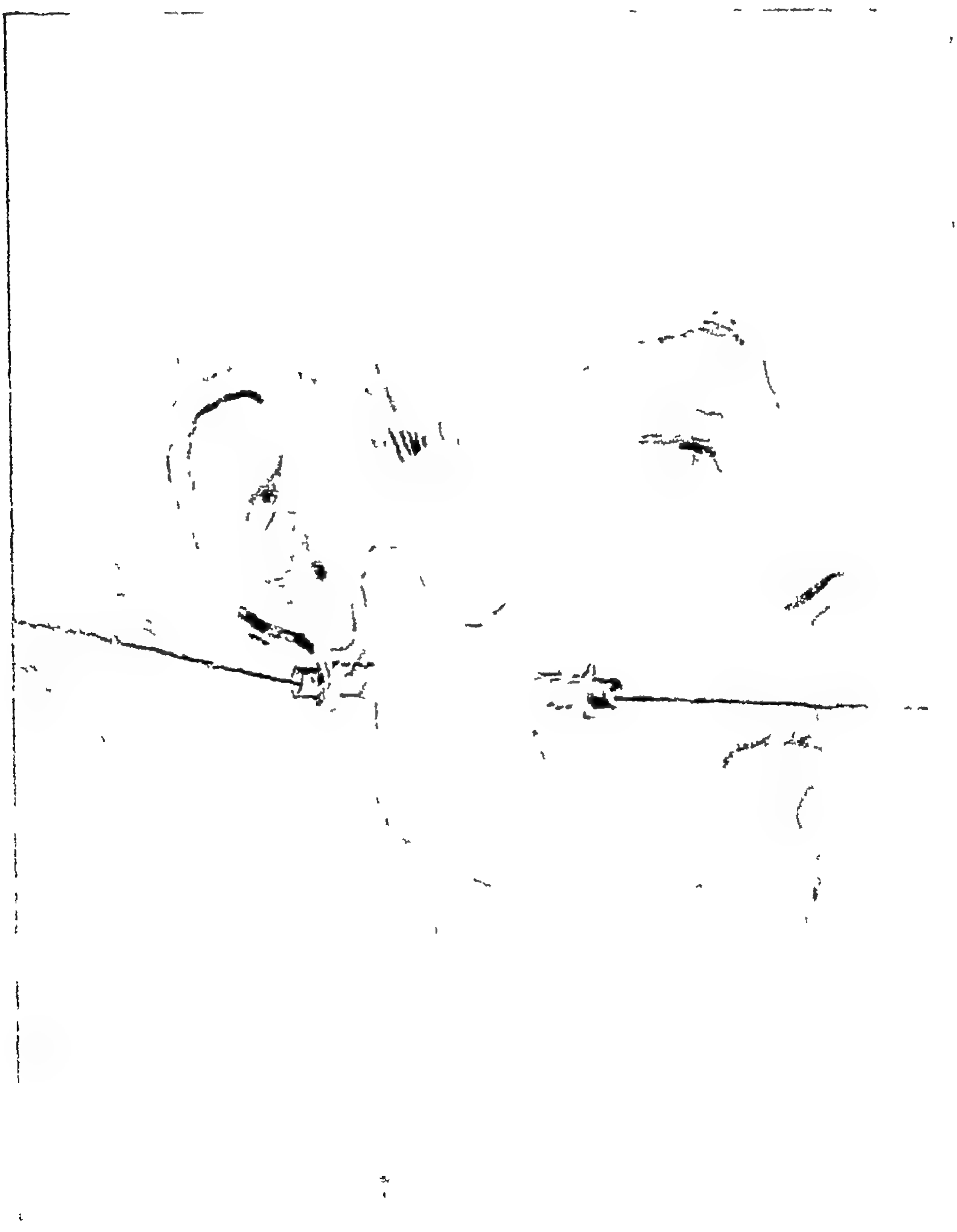


Figure 333 Closed ramisecti

back of the ear lobe) A pair of fine scissors or a Joseph elevator is introduced and is tunneled through to the edge of the ramus The elevator is worked across hugging the jaw and avoiding the mandibular nerve on the surface of the ramus. A large aneurysm needle or special saw guide is then put through the tunnel and a Gigli saw is pulled back through Pieces of metal tubing are then threaded over each end of the saw and introduced through the soft tissues to the border of the bone on each side While these are held in place by an assistant to protect the skin the jaw is sawed completely through (Fig 333) Following section on both sides the jaw is set back to the desired position and immobilized by interdental fixation A pressure dressing is applied over the operative sites for one or two days.

The patient is instructed in keeping the teeth clean and in maintaining nutrition on a diet of ground and puréed foods The interdental fixation may be removed in eight to ten weeks

Figure 331 Retruded middle third of face with prognathism lower jaw Preserved cartilage transplant to nose holds nose upper lip and entire middle third of face forward so that prognathism is not so noticeable

There is considerable variation in the level where the mandibular nerve enters the bone below the sigmoid notch but at the level of section just described the nerve is spared

Various types of bilateral osteotomy of the body (horizontal ramus) of the mandible can be used. They are indicated chiefly for dealing with a con

comitant open bite, or when the mandible is so long from angle to chin that it is not possible to set it back in the vertical rami The horizontal osteotomies present many more problems during and after operation and will not be discussed here, as they are used for problems of prognathism in its own right not necessarily related to nasal balance

THE RETRUDED UPPER JAW

One of the most difficult deformities is the retruded upper jaw with a "pinched-in" facies in the middle third This may be associated with a degree of prognathism and nasal deformity Considerable improvement (Fig 332) can be effected by (1) correcting the nose, (2) setting back the jaw, (3) advancing the upper lip, and (4) implanting a crossbar of cartilage across behind the lower end of the nose, as described in Chapter XII

If the deformity is not too severe, improvement may be obtained by building the nose forward with an L-shaped transplant of cartilage, and it may carry the lip and adjacent cheek slightly forward with it (Fig 334)

Chapter XXIV

BENIGN TUMORS OF THE NOSE

BENIGN TUMORS OCCUR to a somewhat limited extent in the nose and most of them arise from the skin Rhinophyma is discussed separately in Chapter XXVI

Warts occur on the nose as elsewhere and are most commonly seen in young children in the vestibule where they may be implanted from the fingers They are treated by complete removal with a fine electric cautery wire using procaine infiltration anesthesia

Nevi are common in the skin of the nose especially the lightly pigmented raised fleshy variety Most of these are removed with the electric cautery using it as a knife to cut completely around the lesion and then under it so that the lesion is removed in toto as an intact plug It is essential to remove it completely the first time and not leave any remnants behind These wounds granulate up from the bottom and heal over with a flat round scar in two to three weeks A word of caution is in order however about removing moles from the tip of the nose in this manner it may leave a depressed scar which is very unsightly in this location Large flat nevi are usually surgically excised and the wounds closed by undermining and suturing or by the use of a small full thickness skin graft from the clavicular region or from behind the ear

Spider telangiectases are often seen on the nose and may bleed frequently enough to be a nuisance These are probably minute arteriovenous fistulae and it is necessary to destroy only the central raised body portion This is done with the fine cautery

Keratoses of the dry or senile variety are due to sunlight and since the nose is the most prominent feature on the face they are particularly prone to occur here. They are usually lightly burned out with the fine cautery under local anesthesia Since they are caused by too much radiation they should not be treated with further radiation (e g ultraviolet x ray or radium) When they keep recurring in profusion in a skin that is atrophic and telangiectatic the condition is known as sailor s skin or farmer s skin " and squamous cell carcinoma can usually be found in some areas. This lesion differs very little from an x ray burn and should be treated by excision of the involved skin and resurfacing with a skin graft. These keratoses and "sailor s skin are precancerous lesions and worth while cancer prevention can be effected if the patients are kept under observation and treatment is instituted in each instance before cancer occurs

Figure 335 *Left,* Growing arterial hemangioma in tip of nose, capable of producing great deformity *Right,* Six months after single treatment with radon seed

HEMANGIOMAS

These blood vessel tumors present the most serious and common cosmetic problems of any of the benign tumors of the nose For purposes of treatment, they can be divided into three classes, though a few of the tumors appear to be mixed

Arterial hemangiomas are bright red, raised, growing tumors seen in very young babies (Figs 335, 336, and 337) They will destroy skin locally, and may invade bone, cartilage, or adjacent features They vary considerably in their rate of growth, some growing very slowly and others growing so rapidly as to lose thier own blood supply with resultant necrosis and erosive ulcers Those of the latter variety are especially hazardous about the columella and tip of the nose where they produce extensive deformities (Figs 283 and 309) These may tend to retrogression in the second or third year, but in the nose they may destroy much tissue and produce difficult deformities before this takes place, so that it is best to stop their growth when first seen Some of these lesions can be surgically excised, and that seems preferable when possible Some small lesions can be destroyed by a fine cautery, and the scar excised later if necessary

Large or deeper arterial hemangiomas may require treatment by radiation It is difficult to construct surface radium applicators that will yield a uniform dose over these irregular surfaces, and there are difficulties in proper screening and uniform dosage by x-ray in these moving babies, so that

often radon seed seems the best form to use These seeds are implanted interstitially to get a light uniform pattern of radiation over the involved area The total dosage should be the least possible amount which will stop growth and *it is not necessary to bleach out the lesion within a few weeks* Each seed contains 1/10 to 1/8 mc radon and they are spaced about 1 cm apart in all directions. Even with this light dosage the cartilages and bones of a baby s nose are so sensitive to radiation that there may be some slowing of growth but the risk of allowing the tumor to grow unchecked and thus destroy the features must be balanced against the risk of treatment in each case

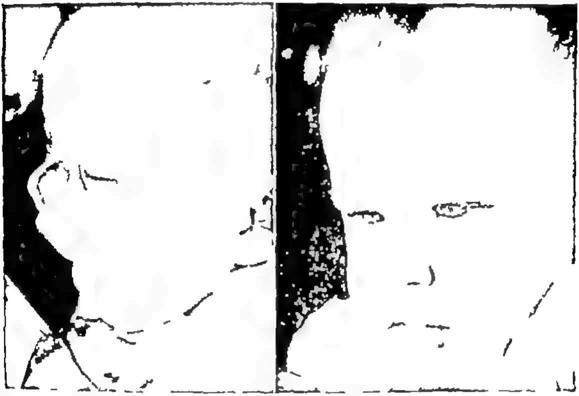


Figure 336. Rapidly growing arterial hemangioma controlled with single treatment with radon seed. Tumor had destroyed the overlying skin in this instance so that area was later *resurfaced with a free skin graft*

Port-wine stains are congenital anomalies of the capillaries in the derma rather than true tumors and they grow only as the child grows In adult life they may take on growth characteristics usually thickening however rather than spreading out. They are flat in young children and are usually more of a purplish red color rather than the bright cherry red color seen in arterial hemangiomas They are not sensitive to radiation *in any form* *Various* crude treatments used in the past to destroy the involved skin included injections of boiling water cauterization with acids etc All of these leave granulating ulcers which must heal by scarring and the same may be true if dry ice is used unless great *caution is employed*

Figure 337 *Left,* Massive arterial hemangioma of entire nose and frontal region treated elsewhere with radiation with successful elimination of tumor The scar surface remaining required removal and resurfacing with a free skin graft several years later, with the result shown at *right* and *below*

Often these stains are best treated by covering them with special cosmetics, especially in girls Otherwise, it is usually best to excise them, close the wound by undermining and suturing or by switching local flaps when feasible, or by skin grafting (Fig 338)

Cavernous hemangiomas arise in the subcutaneous tissues rather than in the skin and are composed of a collection of blue, dilated veins When possible, they may be injected intravenously with one of the sclerosing agents

such as 5 per cent sodium morrhuate Surgical excision is always preferable when feasible. Interstitial radiation will obliterate vessels of small caliber but not any larger veins.

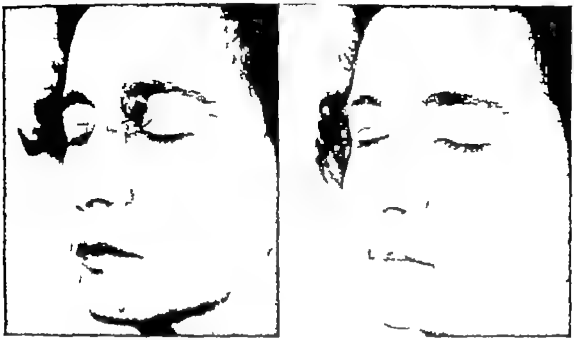


Figure 338 Congenital port wine stain of nose and eyelid which grew thicker in adult life. Treated by excision and skin grafting in one operation

LYMPHANGIOMAS

These are slow-growing soft spongy tumors which apparently arise in the subcutaneous tissues but sometimes involve the overlying skin as well They are not collapsible and do not distend when the head is dependent When the overlying skin is involved it is often rough or warty in character and may be stained a tan or *café au lait* color Microscopically these lesions contain many dilated lymph channels and many nerve filaments so that they are sometimes classified as neurofibromata when multiple they are nearly always classified as von Recklinghausen s disease

Although radical surgery (excision of the nose and reconstruction) has been advocated a more conservative course seems worth while in most of these patients If there seems to be little involvement of the skin the tumor can sometimes be dissected out subcutaneously gaining access through nostril rim incisions (Fig 339) There may be some recurrences necessitating further surgery but it is possible to keep the appearance of the nose fairly satisfactory

When there is considerable involvement it may be best to remove the overlying skin with the tumor but leave the perichondrium on the cartilages and resurface the area with a free skin graft. Deeper involvements may re

quire more radical surgery such as partial excision of the nose and reconstruction However, malignant change is uncommon in these, and the main problem is usually that of appearance, so that the least radical surgery that will maintain this is usually best

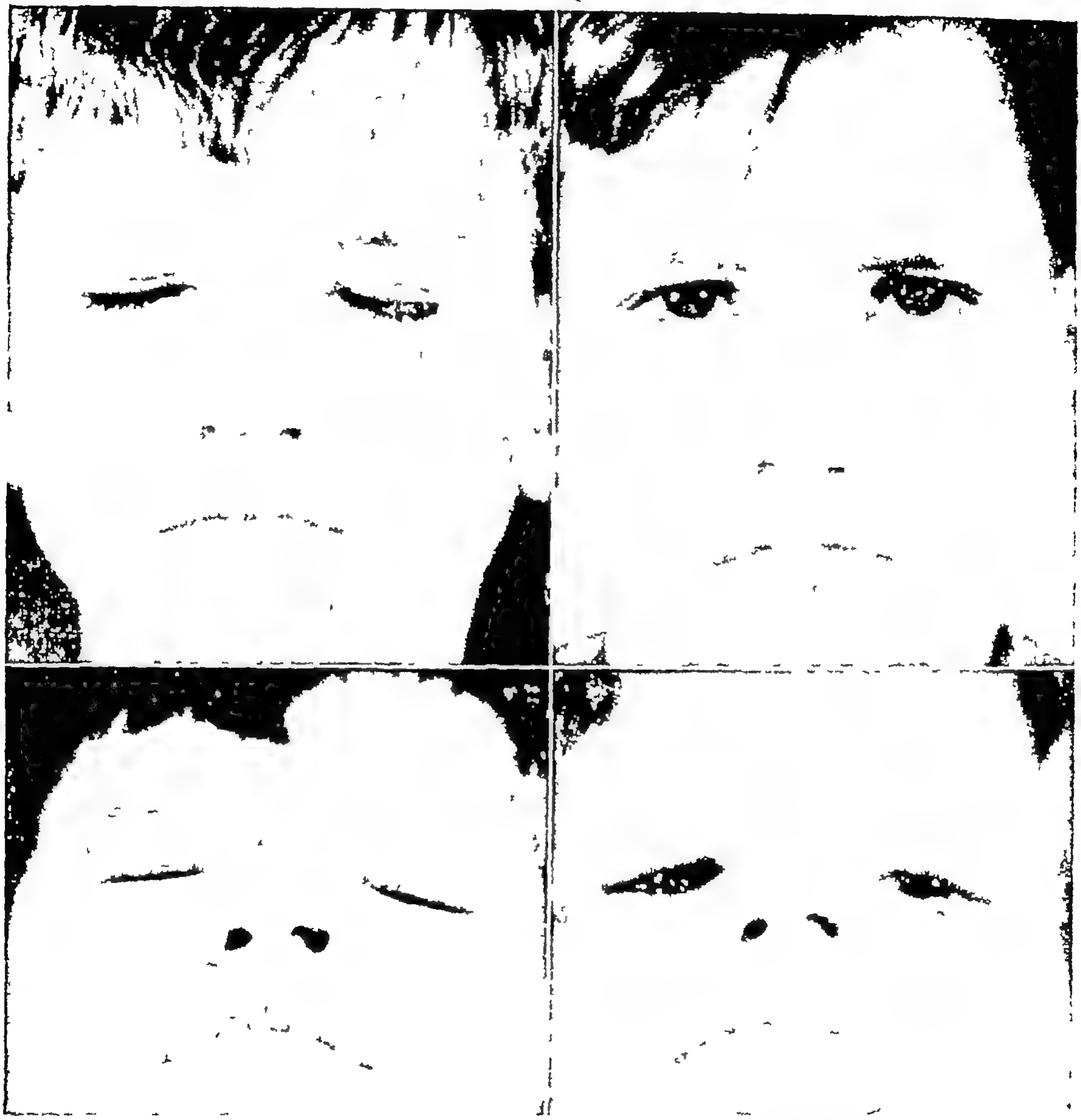


Figure 339 Spongy lymphangioma of nose, removed by sharp dissection through a rim incision

DERMOID CYSTS OF THE NOSE

Dermoid cysts of the nose usually occur in the midline, but may occur near the canthi There is often a small fistula communicating with the skin surface and having its opening in the midline, either on the dorsum of the nose or on the columella Most patients will have a history of repeated infections in the area (Fig 340)

The midline cysts are probably formed from pinched-off epithelium in the fusion of the nose and often extend between the bones and even down into the septum where they may form septal cysts Complete excision of all parts of the cyst including the fistulous tract is essential for cure This often involves a long tedious dissection and is best done in children under general anesthesia

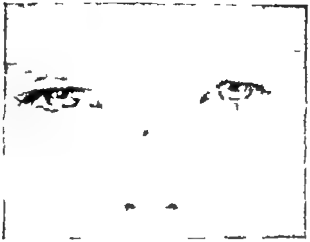


Figure 340 Infected dermoid cyst of nose with characteristic midline sinus. Scar of a previous infection is seen opposite the other canthus.

SEBACEOUS CYSTS OF THE NOSE

These tend to occur in the lower part of the nose where the oil glands are large The treatment is the same as elsewhere excision together with a tiny ellipse of the attached overlying skin with the direction of the incision so as to get the best closure without deforming the nostril borders or other structures In dissecting them out, it is often helpful to put a finger inside the nostril to distend and immobilize it.

Chapter XXV

CANCER OF THE NOSE*

THE COMMON MALIGNANT tumors of the nose are basal-c
cell carcinomas which usually arise in the skin, although
sions arise very occasionally in the mucous membranes

Surgery and radiation are the only effective means of
elsewhere, but radiation is of doubtful value because
structure of the nose Since the nose consists only of a bony
framework covered with skin on the outside and mucosa
cinomatous invasion of only one or two millimeters will c
or cartilage, in which situations radiation is ineffective ex
doses For this reason, surgical removal is preferred, with s

Since the nose is the most prominent feature of the face
of lesions imposes the double duty of eradicating the carcin
a satisfactory repair The results are likely to be better if
repair are planned simultaneously, and if the same surgeo
with his original plan (see Chapter XX)

It is not a satisfactory policy to employ radiation for
nose, and then use surgical excision in case of failure Sev
sues form notoriously poor bases for subsequent repairs
composite grafts, or even free skin grafts, which stems fr
sistance to trauma of any kind

Accurate diagnosis of the anatomical extent of the lesio
gical treatment then consists of complete excision, together
surrounding margin of normal tissue, and repair The cl
the various types of carcinoma is important in planning

SQUAMOUS-CELL CARCINOMA OF THE

The lesion arises in the surface epithelium and, at fi
outward as a "cauliflower" mass with extensive ulceration
ulceration and bleeding, and rapid rate of growth, pati
medical aid fairly early for external lesions (Figs 341, 342
ever, the rare mucosal lesions may reach considerable size
attention

The skin lesions usually develop on pre-existing kera
skin" or "farmer's skin," or on old radiation burns (see

"Sailor's skin" (also called "farmer's skin") occurs in older individuals with thin dry blond skins who have had many years' exposure to sunlight and who sunburn rather than form a protective tan. In the early stages there is atrophy of the skin with thinning, excessive smoothness (or glaziness) and depigmentation or whiteness. This is followed after a period by the development of telangiectases and general redness of the skin and still later by kerototic plaques. The latter are elevated from the surface, dry, rough, white or light brown in color, and scale off repeatedly in the beginning. They are localized areas of overactive growth of the epithelium and any one of them in time may develop into squamous carcinoma although many of them do not.

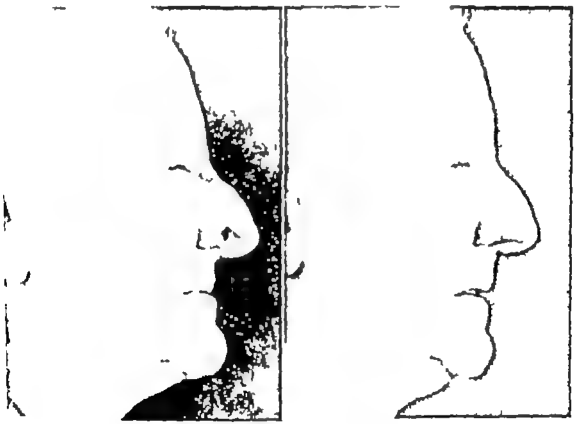


Figure 311 Defect from cautery excision of carcinoma of ala. Repair in one operation by use of free composite graft of skin and cartilage from the ear.

This type of skin is produced by the cumulative effect of ultraviolet radiation over many years' time and closely resembles the changes produced by x radiation and radium. Therefore it seems wrong to treat any of these keratoses or cancers which have been caused by radiation by still more radiation.

The keratoses (which are the precancerous lesions) can easily be destroyed by placing a small amount of procaine under each one and lightly burning it out with the fine hot cautery. This is a worth while type of cancer

prevention work and deserves to be more widely practiced Any keratosis that cracks open or ulcerates must be regarded with suspicion and should be excised immediately, either with the cautery or the knife

Once "sailor's skin" develops, the change is progressive and irreversible Such patients are observed every three to six months, and any active keratoses are burned off or excised This is particularly true if the patient has had one carcinoma If the keratoses occur with increasing frequency and activity, the best treatment is excision of all of the involved skin and resurfacing with a free skin graft This regime will almost certainly prevent serious development of carcinoma in patients who would otherwise have a high incidence

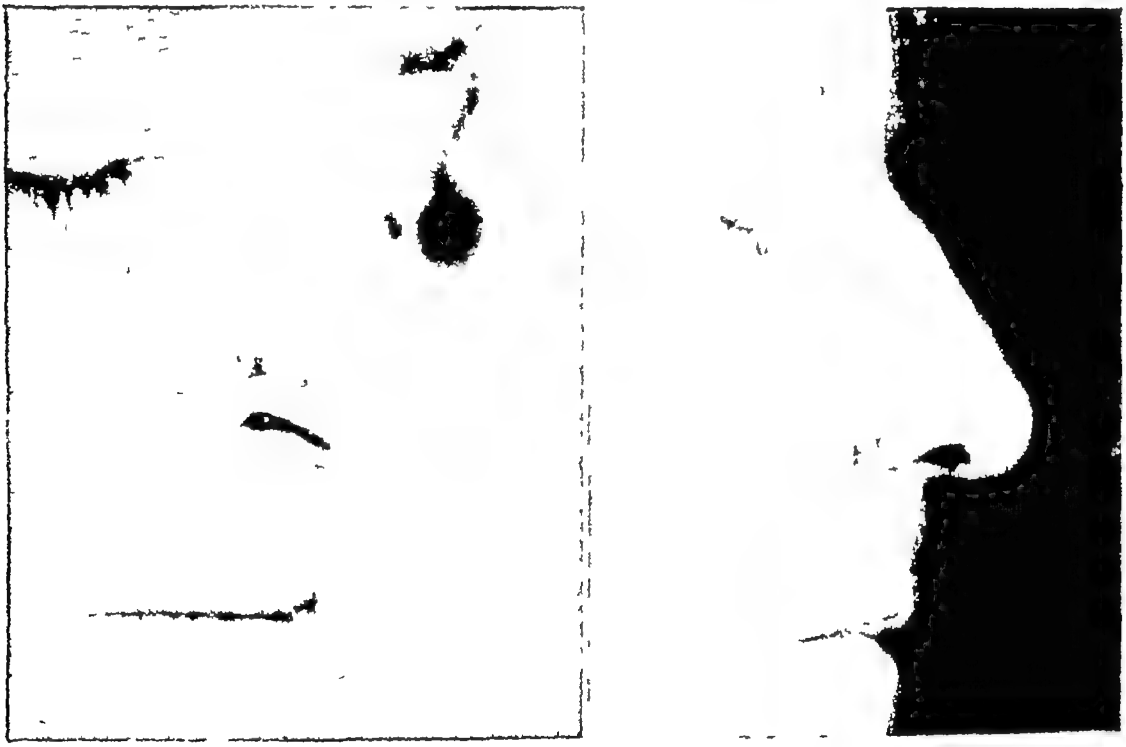


Figure 342 Squamous carcinoma of ala, excised, and immediate repair with composite graft from ear at same operation

BASAL-CELL CARCINOMA OF THE NOSE

Basal-cell carcinomas develop predominantly in patients with oily skins who tan They are even more commonly seen in younger patients than squamous carcinoma (with the single exception of xeroderma pigmentosum)

The lesion apparently begins in a plugged oil gland in which the inspissated sebum is somewhat carcinogenic An early change is the development of a raised ring of subcuticular epithelium around the pore, resulting in a tiny doughnut-like lesion which is a sebaceous adenoma The large pores over the lower half of the nose and in the creases outside the alar bases are

common sites for these lesions. The sebaceous adenoma may be relatively quiescent for many years, but may develop into basal-cell carcinoma at any time

Many microscopic forms of basal-cell carcinoma have been described but the differentiation of the three chief gross clinical forms is the most important for purposes of treatment There are (1) the solid or bulky form (2) field fire" form and (3) the invasive or rodent ulcer" form

Figure 318. Squamous carcinoma of membranous septum Treated by wide surgical excision and immediate repair with free full thickness skin graft from the back of the ear

The solid basal-cell carcinoma is the most slow growing and relatively innocuous variety so that it has given rise to the erroneous conception that basal-cell carcinomas are not serious It is commonly raised from the surface in a hemispherical form usually without ulceration and may be mistaken for a non pigmented nevus The differential diagnosis is important The basal-cell lesion on light stroking or palpation is indurated on examination with a magnifying lens the covering epithelium is exceedingly thin and without any wrinkles there are commonly a few small dilated vessels on the surface or the whole lesion may have a pinkish color there are no hairs growing from it. The non pigmented nevus will commonly have a few flecks of brown pigment in it which can be seen with a lens, in spite of its name it is relatively soft on light palpation the covering epithelium is thicker and may have a few wrinkles in it, or hairs growing from it dilated blood vessels over the surface are rare

Many doctors nurses and medical students mistake these lesions on themselves for moles and they may occur even in older children The lesions may be so slow growing as to be practically stationary for many years but may also change over into one of the other types at any time It is es

pecially desirable to prevent this on the nose, as otherwise bone or cartilage may be rapidly invaded

An occasional solid basal-cell lesion on the tip of the nose will spread out centrifugally through the derma and subcutaneous tissue, without much elevation On casual inspection, there is not much to be seen except a very slight discoid lump, with glaziness and sometimes pinkness of the overlying skin When the skin is picked up between the examiner s fingers, a disc-like mass of hard tissue can be felt During the early years, the tumor can be moved over the tip cartilages, but cannot be separated from the skin Later, it also becomes attached to the cartilages (Fig 344)

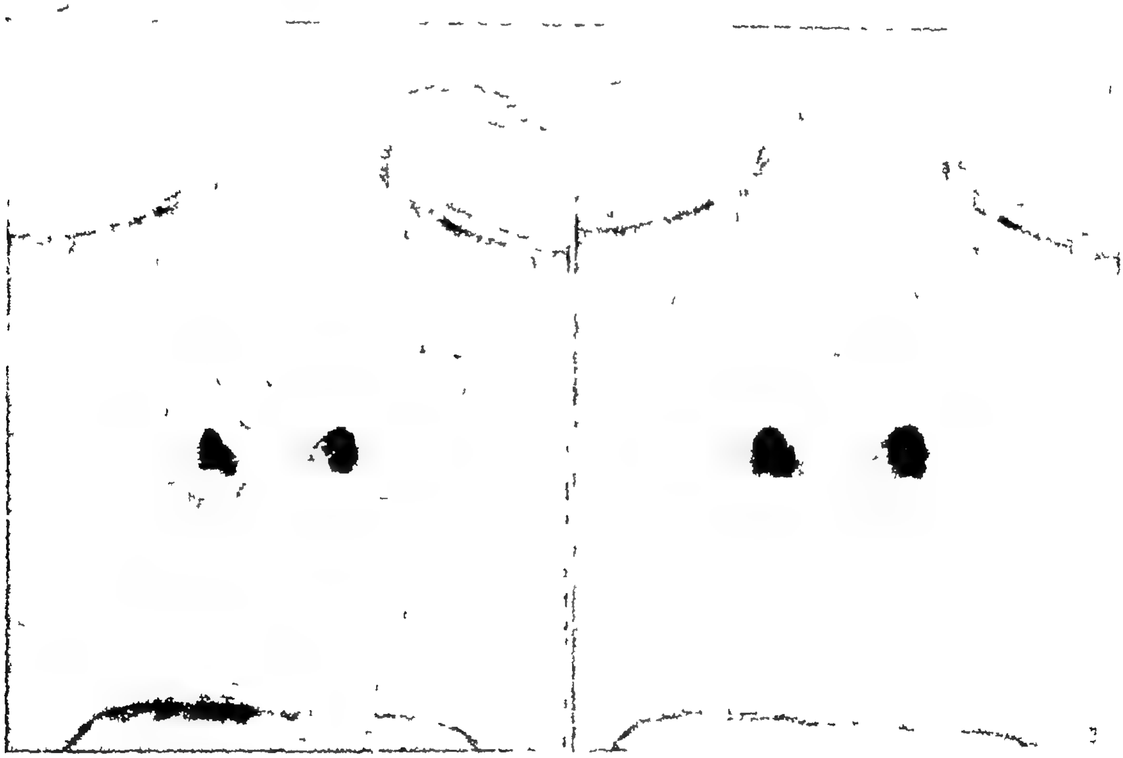


Figure 344 Solid discoid basal cell carcinoma in the skin of the tip of the nose Very little visible deformity, but mass palpable over area shown by dotted line Excision down through alar cartilages to the lining all around and immediate repair with flat composite graft of skin and cartilage from the ear

"Field-fire" basal-cell carcinoma is a variety which spreads centrifugally through the derma and which grows much more rapidly than the solid type There is commonly a raised edge of active carcinoma all around the peripherey of the lesion, the central area may be covered with some thin scar epithelium, with or without small ulcerations in it It has been likened to a fire in a field on a still day, the active flame spreads in an ever-increasing circle, leaving a burned-out center with occasional scattered glowing embers behind Biopsies from the central portion of one of these lesions may show only scar, so that they have erroneously been thought to be "self curing"

carcinomas. It is nevertheless essential to remove the entire lesion as there are often scattered clumps of carcinoma cells in the central portion These also have been said to be multicentric growths but this does not explain their behavior

The tip of the nose is a common location for field fire lesions. In the early stages they may be movable over the cartilages (Fig 345) but nearly always invade them later A field fire lesion may change over into a rodent ulcer at any time

Figure 345 Field fire" basal-cell carcinoma of tip of nose still quite superficial and movable over alar cartilages. Surgical excision and immediate repair with free full thickness graft from clavicular region

Invasive or 'rodent ulcer' basal-cell carcinomas are some of the most malignant and difficult to cure of all lesions. They may have their origin in sebaceous adenomas solid or field fire lesions or in radiation burns.

They grow rapidly as solid tissue which sloughs out in the center leaving an ever deeper crater with some induration around all edges The tendency to burrow deeply is marked particularly along the pyriform recess back into the maxillary sinus (Fig 346) and from the inner canthus region back into the orbit and ethmoid sinuses (Fig 347) Patients have been seen with a surface ulcer about the size of a match head but with deep involvement through the maxillary sinus hard palate nose and ethmoids so

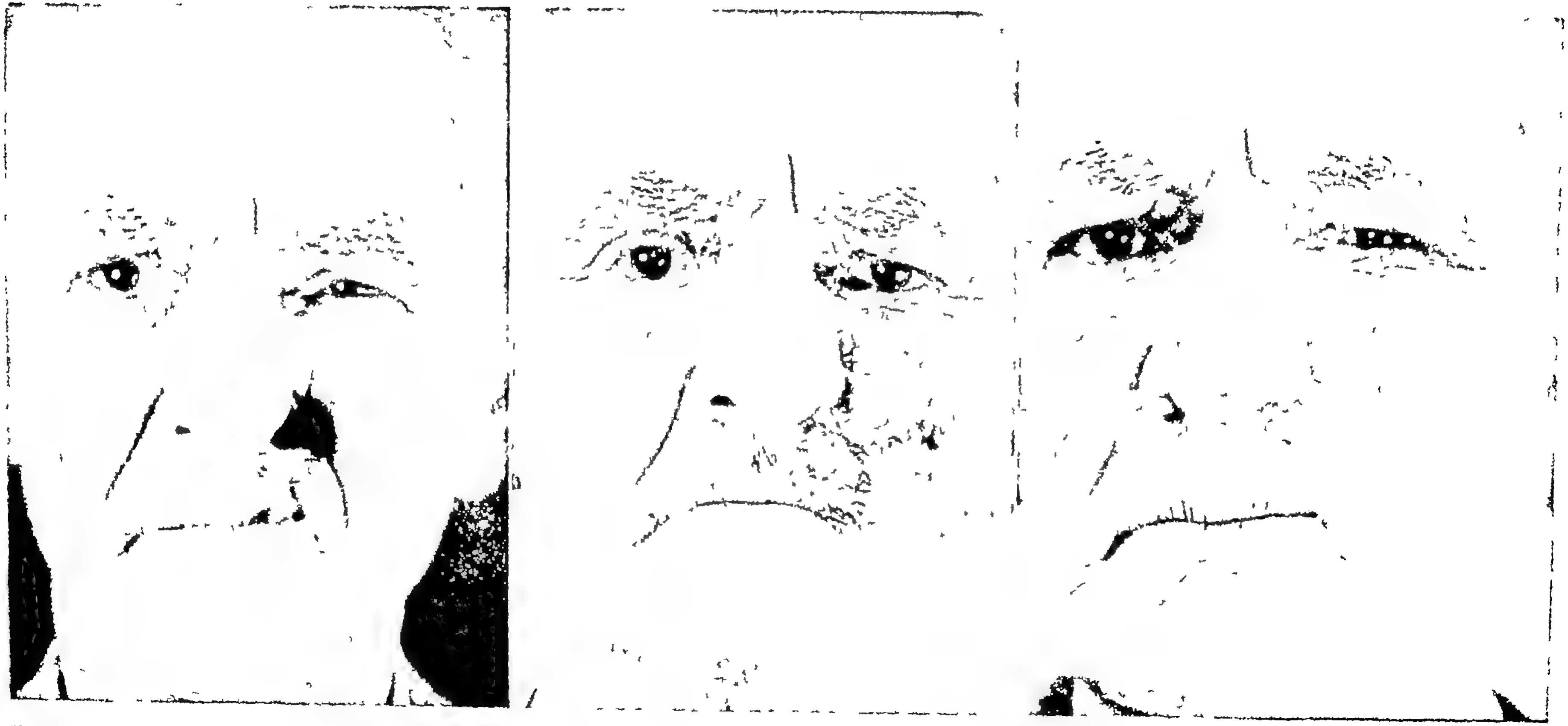


Figure 316 Defect from deep excision of invasive basal cell carcinoma, with fresh repair and late result shown Repair affected by removal of scar and switching of local flaps

Figure 347 Invasive basal cell carcinoma near inner canthus. Deep excision included the canthus and went through the nose into the ethmoids. Repair with direct forehead flap Results shown shortly after repair and one year later

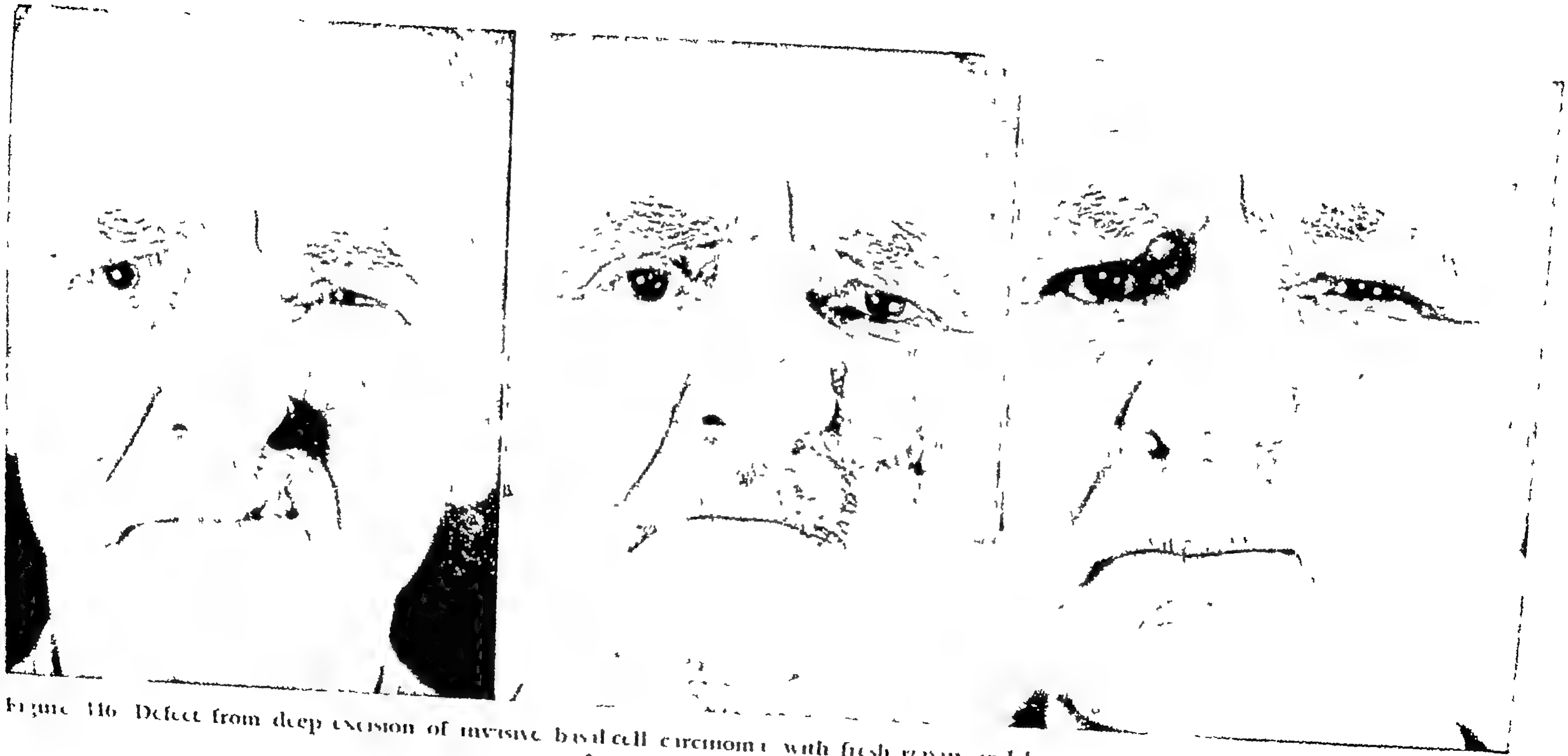


Figure 116. Defect from deep excision of invasive basal cell carcinoma with fresh repair and late result shown. Repair effected by removal of scar and switching of local flaps.

Figure 317 Invasive basal-cell carcinoma near inner canthus. Deep excision included the canthus and went through the nose into the ethmoids. Repair with direct forehead flap Results shown shortly after repair and one year later

that the true extent of the lesion is usually much greater than is anticipated In time, sloughing becomes more pronounced, so that these lesions can erode off almost the entire face

Cures are so difficult that there should be no hesitation in employing the most radical initial surgical extirpation, followed by radiation if necessary Neither the surgery nor the radiation will produce as much deformity or misery as will these lesions if unchecked

The best treatment of course, is the recognition and removal of all possible antecedent lesions before they develop into a "rodent ulcer"

TREATMENT OF CARCINOMAS OF THE NOSE

Small superficial squamous-cell carcinomas and small solid basal-cell lesions can be removed with the fine cautery and allowed to heal by granulations or can be excised with the knife and the wounds closed by primary suture

Larger lesions in an area which are still superficial enough to move freely over the underlying cartilage or bone can be excised, and the area immediately resurfaced with a free skin graft (Fig 343), usually from the clavicular region

A considerable number of lesions will be seen which are adherent to the tip cartilages, but in which the mucosa moves freely under the cartilages In these, excision should extend down to the mucosa all the way around, and an immediate repair can be made with a free composite graft from the back of the concha of the ear Since this graft contains cartilage with skin on only one side, it is known as a "flat composite graft," and is exceedingly useful for this type of repair (Fig 344)

Small lesions which nevertheless perforate through to involve the mucosa will require full thickness excision These commonly involve the nostril wall If the defect is not too large, it may be repaired immediately, or later, with a composite graft from the ear (Figs 341 and 342) Larger defects may be repaired with a pedicle flap from the adjacent cheek, and still larger defects will require repair with a forehead or arm flap (cf Chapters XIX and XX)

Some patients are seen with large lesions requiring removal of most of the nose The technique of full nose reconstruction is described in Chapter XX

Radiation treatment may be indicated sometimes, and if external roentgen treatment is not advisable, interstitial radiation with gold radon seed of appropriate unit dose is relied upon The proximity of bone and cartilage interferes with this as with other forms of radiation

Squamous carcinomas of the nose occasionally metastasize to the preauricular or superior deep cervical lymph nodes, but are usually slow to do so

When this occurs regional gland dissections are essential The uncommon mixed basal-squamous lesions may metastasize as pure squamous-cell secondary deposits

Perhaps even more important than the treatment of established carcinomas is their prevention by the recognition and eradication of precancerous lesions Excision and grafting of areas of sailor s skin is an especially good example of this

Chapter XXVI

REPAIRS OF SCARS, BURNS, TATTOOS, RHINOPHYMA, ATRESIA, HYPERTELORISM, AND RARE CONGENITAL ANOMALIES

EXCISION AND READJUSTMENT OF SCARS

A SCAR MAY BE NOTICEABLE because it is raised, depressed, wide or irregular, or because it distorts some regular contour such as the nostril border or columella. Exact diagnosis of the particular deformity is essential to the planning of the repair. A scar may produce a shadow in some lights that is more noticeable than the scar itself.

Large corrugated burn scars are excised and resurfaced, usually with a split graft from beneath the breast or a full thickness one from above the clavicle. Repairs with pedicle flaps are rarely necessary and, if they are used over an adequate framework, are not considered as total nasal reconstruction. Irregular or missing borders are repaired with free composite grafts of skin and cartilage from the ear (see Chapter XIX).

Depressed linear scars often can be corrected by oval excision and resuturing. Skin edges that once have healed turned in have an inherent tendency thereafter to remain curved in this direction, so that it is often best to carry the excision out to the normal elevation on either side. After hemostasis and any necessary undermining of the edges, they are carefully approximated with interrupted subcuticular fine white silk sutures (except in areas of large oil glands) and the edges finally adjusted with interrupted fine silk sutures placed about 1 mm from the margins (Fig. 318). These are covered with a sliver of fine mesh grease gauze, then strips of sterile adhesive, and an external splint for protection. The sutures may be removed in two to five days, but support is maintained with sterile adhesive or collodion gauze for about ten days. Very fine deep catgut is also used for closure and sterile adhesive across the wound without surface sutures if the edges will stay together and on even level.

It is important to realize that many scars may be made perfect in the operating room, but that the patient may not retain all of this advantage in healing, so that it is best to inform someone in the family, or the patient, that the final result probably will not be perfect. Many scars do become invisible, but a scar is there and others sutured just as carefully may spread or depress to a more noticeable extent.

Wide suture marks can always be avoided, however, and it is better to have a wound open in a linear scar than to have the cross hatching of wide

sutures that have cut in Removal of these cross-scars may be impossible with out distortion and they may better be left in at times.

Repairing scars on the nose is not like working in loose tissue such as the neck. The nose is immobile and contains little tissue that can be shifted easily

Figure 348 Depressed scar above tip The repair consisted of reconstruction of the alar cartilages to reduce the height of the tip shortening of the nose and local scar revision

Radiation treatment of scars is of value at times but it cannot improve distortion or unevenness. Such treatment for scars is best carried out by a radiologist.

Depressed wide scars may require subcutaneous build ups with cartilage or if the surface is of poor quality excision and pattern replacement with a composite free graft of skin and cartilage

Raised or hypertrophied scars vary in the treatment required. They are occasionally seen after approximately a month in wounds that have had good initial approximation and in which healing has been by primary intention These will often flatten out spontaneously in a few months as the fibrous tissue whitens and contracts If the initial approximation has been questionable or the wounds badly contaminated or slow in healing secondary excision and resuture will probably be required However even in these it is best to wait until the tissues have softened before operating

Figure 549 *A*, Trap-door flap scar in most of one nostril *B* Rotated down into better position and junction with rest of nose smoothed out

Figure 550 In primary closure of wounds such as this the known points of the nostril rim should be approximated first Secondary repair was by opening the original Y and backing the V out of it far enough

Trap-door flaps will almost always require secondary adjustment. These are angled oblique cuts usually from glass in which a flap of tissue is elevated In late healing any scar tends to contract in length and in this instance it will cause some lumping up of tissue on the inside of the curve In repair of trap-door flaps opening the entire flap at one time along all sides should be avoided to prevent lumping again in rehealing The repair instead is divided into stages readjusting one side at a time, or if parallel sides are fairly well separated they can be adjusted in one operation and the end segment in a later procedure (Fig 349) It is important not to undercut angles and expect the resultant flap to heal flat and even

Y shaped lacerations present unusual difficulties in adjusting the V segment at the right depth in the Y at the original repair They often require a

Figure 351 Secondary operation to open the scar and readjust the two sides for proper alignment of sections of the nostril rim

secondary repair, opening the Y and sliding the V segment either in or out to its proper level (Fig. 350) The same is true of V shaped deformities care must be taken not to close them as Y's Y shaped tears should be closed as Y's and V shaped ones as V's Mixing such repairs may result in noticeable deformity

Lacerations through the nostril border often result in deformities Some of these require a V-Y correction, others simple opening and linear readjustment (Fig 351). Extensive notching may require interdigitation of triangular flaps (Fig 352), or even a composite graft for correction

Figure 352 Small portion of nostril wall lost from dogbite Repaired by local Z plasty (interdigitation of triangular flaps)

DIRT TATTOOS

When dirt is ground into the tissues by a street burn, or any other simple abrasion, subsequent tattooing can usually be prevented by scrubbing it out immediately, using soap and water and grease solvents if necessary However when dirt or other foreign material is blown deeply into the tissues by an explosive force, this may not be possible, and subsequent removal may also be much more difficult

Superficial dirt tattoos can often be removed with an abrasive under local anesthesia A piece of No 1 sandpaper may be sterilized and wrapped around a roll of bandage, or other suitable block, and used to remove the superficial epithelium and scrub the dirt out It is well to stop at frequent intervals, ele

tain hemostasis by weak adrenalin compresses and examine the depth so as to avoid sandpapering completely through the derma The wound is dressed with fine mesh grease gauze and healing is the same as in a split graft donor area (Fig 353)

Deeper areas will require grinding out with abrasive tips on a dental engine removal by deep curettage with a chalazion curette, destruction with a fine cautery surgical excision with a knife and resuturing or in severe instances block removal and skin grafting

Figure 353 Old dirt tattoos mostly removed by abrasion, but excision and suturing used for the deeper areas.

RHINOPHYMA

Rhinophyma is essentially a sebaceous adenoma of the skin of the nose involving principally the tip but often occurring over the entire nose and even out on the cheeks The sebaceous glands become long and tortuous often one centimeter or more in depth Cystlike collections of sebum occur in the depths and become secondarily infected from time to time Patients may be distressed because of recurrent infections the general unsightliness of the lesion or obstruction to breathing

The operation for correction is done under local anesthesia The borders of the mass and the nostril borders are outlined following which the mass is surgically excised. The mass involves only the skin and subcutaneous tissue the underlying bones and cartilages being unaffected

The excision is done in such a manner as to restore the nose to its former contour, but it is better to remove most of the mass in one piece rather than to shave it down progressively. It is important to leave a normal amount of covering over the framework.

After excision, hemostasis is obtained by compression with weak adrenalin alternated with warm saline sponges.

When dry, the wound is inspected for the presence of remaining deep epithelial islands. If there are a number of these, the wound can be dressed with fine mesh gauze and changed at intervals until spontaneous healing has occurred. Often, however, this process involves enough scar retraction partially to evert the nostrils, so that the tendency at the present time is to remove all visible epithelial islands and resurface the raw area at the original operation with a single sheet of thick split skin graft (Figs. 354 and 355).

VESTIBULAR ATRESIA

This is a congenital condition in which there is narrowing of the vestibular aperture, or partial or total occlusion by skin webs over it. Children with this condition may develop a very high, narrow, palatine arch in time, perhaps due to intranasal suction with every attempt at inspiration.

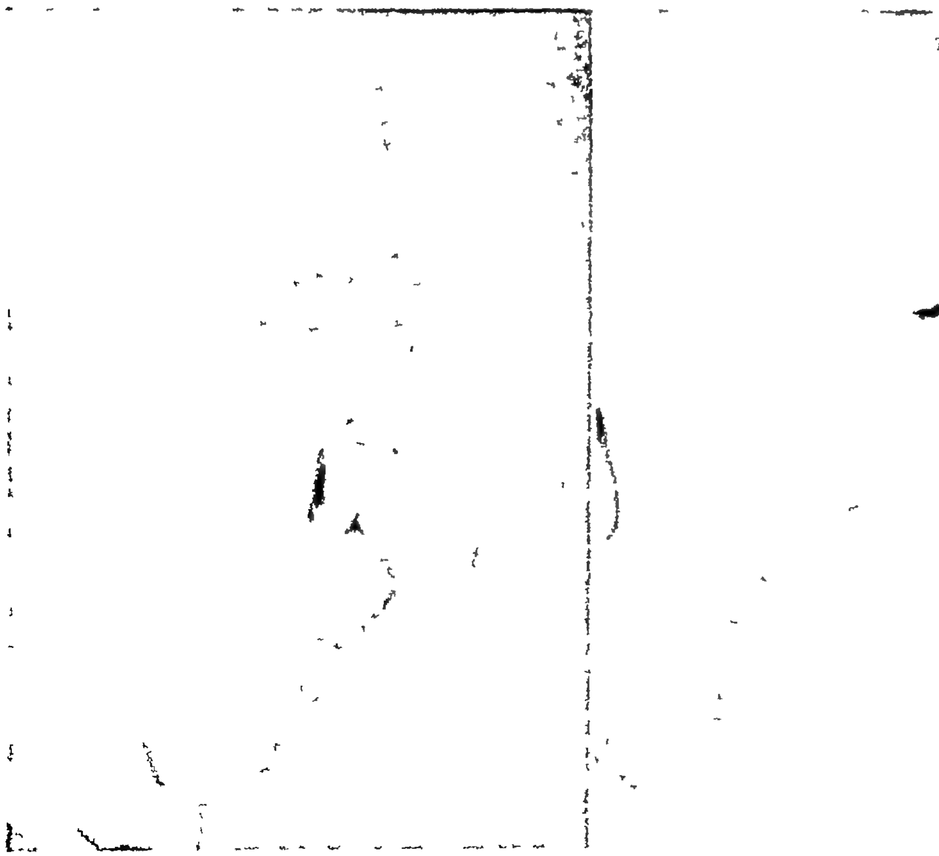


Figure 354. Rhinophyma involving entire nose. Repaired nose with split skin graft.

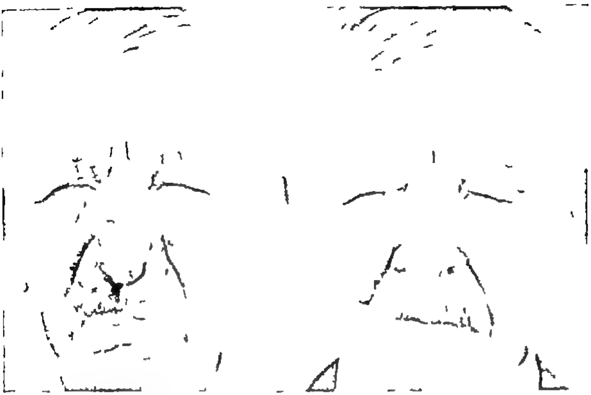


Figure 355 Rhinophyma localized to lower portion of nose. Local excision and spontaneous healing from remaining epithelial islands and wound edges.

A web always represents a lack of tissue rather than an excess and simple excision of the web is always futile If there is only a small web across the floor this may be excised and the resulting raw area covered by switching in a small flap taken from just outside the nostril base as shown in Figure 144 *More severe atresias will have a circular web with an opening the size of a* pinhead or a match head or no opening at all These require excision and coverage of the resultant raw area with a split skin graft (Fig 271) However a circular graft may contract down so that it is best to preserve some parts of the web and switch them at right angles to cover parts of the raw surface, thus preventing complete circularity of the graft.

CHOANAL ATRESIA

There may be congenital complete blockage of the choana on one or both sides by soft tissue or bone When unilateral the only symptom may be more or less constant discharge from the nostril on the affected side. When bilateral there may be episodes of cyanosis and respiratory difficulty and a marked feeding problem

The diagnosis can be made by attempts to pass a small catheter back through the nasal airway into the throat On the operating table the probable thickness and firmness of the obstruction can be estimated by passing a

solid object or instrument back until it meets the obstruction, and then hooking the soft palate forward enough to see or feel the posterior surface of the choana

If the obstruction seems to be thin, or predominantly soft tissue in character, an attempt may be made to puncture through it and ream it out, going through the nose, or from posteriorly, or both A pointed punch can be used initially, followed by graduated curved urethral sounds, and then endoscopic biopsy forceps, followed by septal biting forceps If the lesion is bilateral, it will almost always be best to remove the back portion of the septum over an area a little wider than the original obstruction

When the obstruction is produced by fairly thick bone, it is usually best to split the palate longitudinally in the region of the posterior edge of the hard palate Mucoperiosteal flaps are elevated on either side and retracted to expose the posterior section of the hard palate A block of bone a little larger than the obstruction is then chiseled out of the midline of the back of the hard palate, and carried upward to include the block of obstructing bone and adjacent septum The airway in this area is then made as large as possible, and the mucoperiosteal flaps of the palate are carefully approximated with interrupted vertical mattress sutures

To maintain the opening, an obturator of some sort is desirable Rubber tubing can be passed through the nose, back into the throat, and anchored in place with a stitch through the membranous septum, not through the columella If preferred, a grease gauze or iodoform gauze pack can be placed in the defect and anchored by a suture through the membranous septum to prevent aspiration, this can be removed after four or five days and the rubber tubing substituted at that time Whatever method is used, it is best to keep some sort of obturator in for several weeks

OCULAR HYPERTELORISM AND ASSOCIATED NASAL DEFORMITY

*Ocular hypertelorism** is characterized by an overgrowth of the sphenoid bone, an excessive distance between the eyes, and an unusually broad nose The so-called "double nose" is possibly an extreme of this condition, and wide noses with a square dorsum possibly may represent tendencies toward this deformity.

The overgrowth of the sphenoid is primary and no satisfactory surgical correction has been devised for this or to narrow the distance between the eyes However, narrowing of the nose will camouflage it somewhat and help the general appearance

The nose is narrowed as described in Chapter V (as a primary procedure).

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*Cf Greig, D M Hypertelorism, *Edinburgh M J*, *31* 560, 1924 This deformity is not to be confused with the Treacher Collins syndrome

but with removal of a considerable amount of nasal bone on either side of the septum and with simultaneous excision of a large vertical ellipse of skin from the nasal tip to well up on the forehead (Figs. 356 and 357)

Figure 356 Ocular hypertelorism repaired as described in text.

Figure 357 Improvement of ocular hypertelorism

Figure 358. Congenital absence of the nose, repaired by chiseling out a large airway through the middle third of the face, lining it with a split graft, and a flap for the floor, and then constructing an external nose with a forehead flap. (From Blair and Brown. *Surg., Gynec. & Obst.*, 1931.)

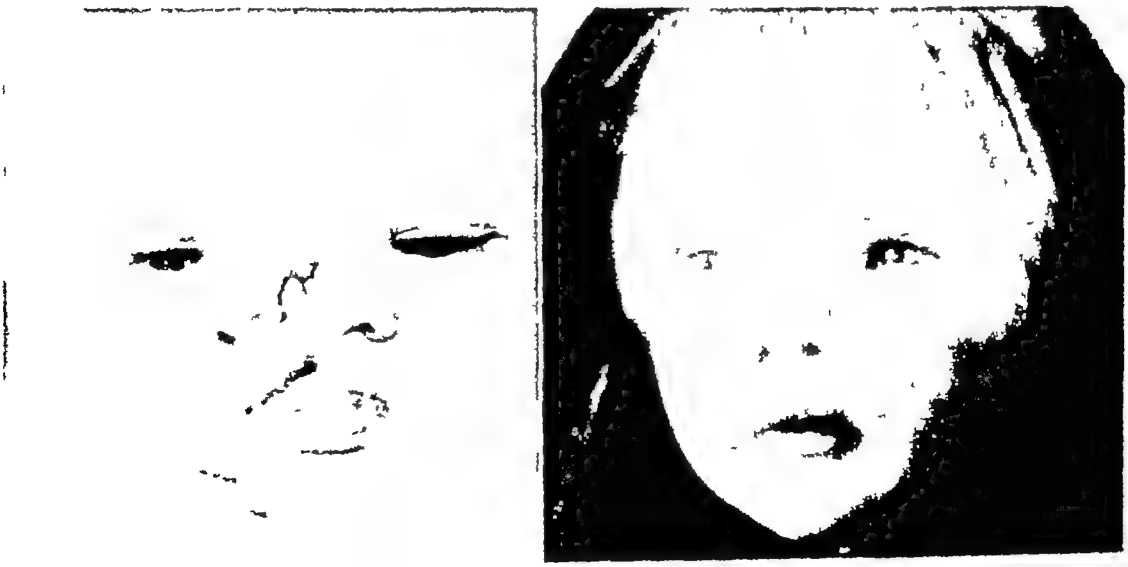

Figure 359. Congenital "double nose" and repair. (From Blair and Brown, *Surg., Gynec. & Obst.*, 1931.)

RARE CONGENITAL ANOMALIES

These include congenital absence of the nose (Fig 358) hemiabsence of the nose and congenital double nose (Fig 359) which is an extreme example of hypertelorism

Total absence of the nose may be repaired by chiseling a large single airway through the middle third of the face, lining it with a split skin graft, and then constructing an external nose from a forehead flap Opening the area may be done through a large trap-door flap with its base below This flap is then turned in to make the nostril floor and as much as possible of the lining of the airway Hemiabsence is treated in much the same manner but unilaterally

In the double nose the excessive width of the bridge may be accompanied by shortness of the nose and a deficient tip As Joseph pointed out the repair can consist of a V Y adjustment downward on the dorsum to shift some of the soft tissues down from the bridge and lengthen and narrow the nose

Chapter XXVII

PROSTHESES

NASAL PROTHESES made in silver and other metals are recorded in the early literature and there has been continuing improvement in them. In some patients who are poor surgical risks, it may be best to cover defects usually from cancer, with prostheses rather than make extensive flap repairs Prostheses are used for various other reasons, such as there being a question as to recurrence of a tumor (Figs 360 and 361)

However, prostheses are not considered satisfactory substitutes for surgical repair when the latter is possible With a prosthesis the patient may still feel that he has the deformity and is covering it with a mask, rather than feeling that the deformity is gone There may be a reticence about meeting people or appearing in public, perhaps due to a fear that the prosthesis may come off or be knocked askew at any moment Some very trying and painful stories are given by patients concerning this point

The expense of repeated replacements of the prostheses and the time consuming effort of putting them on just right each morning are not in significant items Since better repairs are now made with fewer operations than formerly, and the risks of surgical procedures have declined so markedly, the need for prostheses is lessened

Nevertheless, for the occasional patient who does need an artificial replacement of a feature, an excellent prosthesis makes possible for him a life that he could not lead otherwise Prostheses for small defects are not advisable if a small adhesive patch will cover it without unsightliness. No prosthesis of any size or shape is advisable in patients who will not keep it in neat condition, well applied, and in good repair so that attention is not called to it Most people would rather see a bandage or a poor surgical repair than a prosthesis on a patient with a facial defect A solid prosthesis of poor color, poorly applied, gives somewhat the same impresison as a dirty, crusty ill-fitting artificial eye

In comparison of prosthetic and surgical substitution for missing features, it is obvious that a prosthesis cast out of a natural mold of the patient's normal feature will be closer to normal than any surgical substitution From a distance the prosthetic restoration may be the less noticeable On close appearance the prosthesis will still look the most normal in contour and possibly even in color, but it will be evident that it is not part of the patient himself, and the reaction then is based on the observer's natural tendencies and on the patient's attitude toward whatever comments or lack of them there may be

The materials available for prostheses change as new plastic materials appear Those most frequently used at present are latex vinyl resins and acrylics Latex is soft rubbery and when properly tinted may be the most natural appearing of any of them However it soils easily and wears out so quickly that it requires frequent replacements and if the edges are made thin they tend to curl so as not to fit smoothly against the face Acrylic is

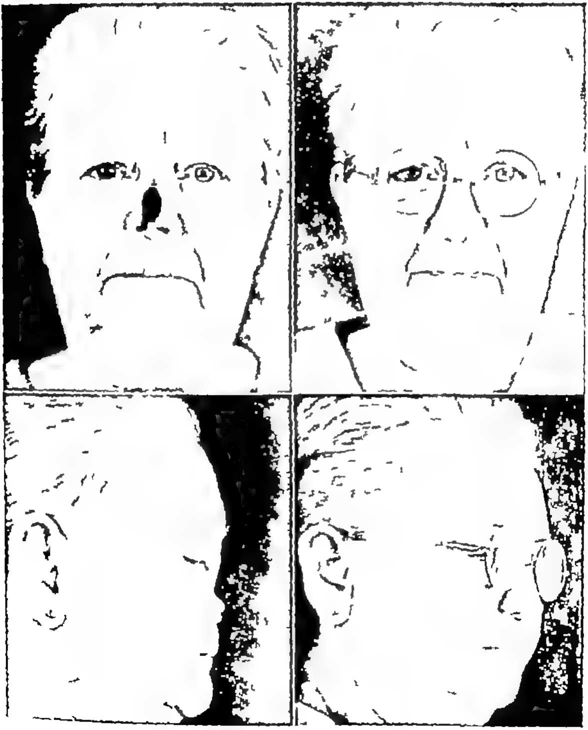

Figure 360 Prosthetic nose made of acrylic by Gertrude Hance.

smooth, impermeable, and can be made in varying degrees of hardness It lasts much longer than latex, can be cleaned much better, and the hard or semihard forms can be made with thin edges which will seal better against the face The vinyl resins are intermediary between these two in their properties, more similar to the soft acrylics

Figure 361 Temporary prosthetic nose used during surgical resurfacing of radiation lesion of face and neck Made by Gertrude Hance

Several excellent books are available on the preparation of prostheses, so that it is not necessary to include that material here However, Gertrude Hance who makes prostheses for our patients, has outlined the following details of their construction

In the total or partial absence of a nose, ear, or some other feature, where surgery is not advisable a substitute may be used in one of the many forms of plastic material available In some instances the situation is such that the appliance is intended only to tide the patient over until further surgery can be done, but if it is to be permanent, a material is used which has as many satisfactory elements as can be found in one product, such as durability, lightness in weight, transclucency, and cleansability. In the early days various metals and vulcanite were used which, because of their hardness, had advantages, particularly where attachment to another prosthesis such as spectacles is wanted However, they are opaque and do not yield a lifelike looking result

The soft compounds such as gelatin mixtures wax etc. do not stand up with use but the most satisfactory materials and the ones most widely used at present are prevulcanized latex an elastic vinyl plastic and methyl methacrylate The latter has some very important advantages such as compatibility with tissue translucency durability lightness, and cleansability

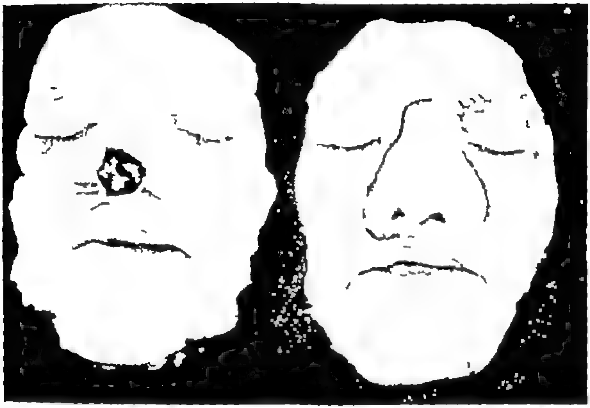

Figure 362 *Left* The first step is a positive plaster cast of the patient s face *Right* Wax nose modeled on patient s cast

The first step of importance when a patient presents himself is to study the form and size of the deformity and determine where the lines of function should best fall The making of a very careful plaster impression of the area to be reproduced including enough of the surrounding features for proportions is the next step This cast is used as the foundation for the clay or wax model of the new prosthesis (Fig 362) Wax is best to use for this purpose because it holds its shape in handling

Trying on and fitting the wax model is a very important step and it also gives the patient an opportunity to see it and form some idea as to the result.

After the wax feature has been found to be satisfactory a mold is made in two sections, upper and lower (Fig 363) Precaution must be taken to see that the two halves of the mold have been treated with a separating medium and *will separate cleanly The mold is allowed to stand till hard* and is then ready to be separated and the wax pattern removed leaving the

cavity representing the feature to be produced in plastic. In removing the wax, just enough heat is applied to allow the softened wax to be lifted out but not enough to melt and infiltrate the plaster, as this will harm the surface for the plastic material.

Figure 363. Negative plaster molds of anterior and posterior surfaces of wax nose.

If latex is being used for the prosthesis, a hole is made through the lower half of the perfectly dry mold in order not to spoil the outer surface of the feature. This hole should be large enough to introduce a funnel through which to pour the latex. The mold is then placed in an oven with the temperature at about 70° C. In about three-quarters of an hour the excess of uncongealed latex is poured out, leaving a lining of latex which will make the hollow prosthesis.

In using acrylic material, the pouring hole in the mold is omitted and the hollow negative mold is packed with the acrylic, measured and mixed according to directions given with the particular brand. The surface of the mold before packing is treated first with a separating solution or tin foiled and there is a trial packing to see that enough of the acrylic has been packed in. The flask is put under a press and then immersed in hot water and kept slowly boiling for about one hour and thirty minutes. When cool, the flask is opened and the new prothesis is cracked out from the plaster mold (Fig. 364). A dental drill with a number of different burrs and points is used to cut and trim the edges, and smooth off any surface irregularities. The acrylic, being tough, can be filed down to make fine edges which can connect so closely with the skin as to be almost unnoticeable. The prosthesis can be

fastened to spectacles or can be kept on with a liquid adhesive or some combination method of fixation can be used

New materials frequently appear on the market so that in the final casting of the feature it is necessary to follow the directions of the manufacturer in each instance. Some of the softer acrylic products seem promising but there is still room for a great deal of improvement in the technique for this work and there are many shortcomings yet to be overcome

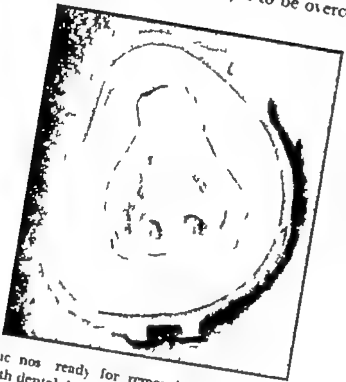

Figure 361 Cast acrylic nose ready for removal from mold. This will be smoothed off carefully with dental drills and burrs, and then attached to spectacles.

Chapter XXVIII

WAR INJURIES OF THE NOSE: METHODS OF RECONSTRUCTION

LESIONS OF THE NOSE in warfare result from gunshot and shell fragment wounds, blast pigmentation, burns, freezes, air tank, and transport crashes, and from the same sources as in civilian life. The deformities and losses are of all extents, and are often associated with injuries of the face, orbit, mouth, skull, brain, and other areas of the body, and with shock and hemorrhage. Although the nose may be a relatively small part of a patient's injuries that may require many phases of surgical care, the problems of reconstructive surgery of the nose require individual study and procedures.

The surgical procedures described in other chapters are basic ones for military nasal reconstructive surgery as well as civilian, and are referred to for details of repair. Important points in war injuries of the nose are summarized here with illustrations of repair, and with notes on directness and simplicity of method.*

The relation of military and civilian plastic surgery of the nose is important, in one way, because of what each may give to the other. Knowledge gained in civilian work is quickly transferred to military use, so that the individual civilian patient also has made a contribution to the war wounded. On the other hand, there has been marked influence on civilians by military plastic surgery as to methods and the training of surgeons; there have been direct benefits to the civilian patient who may require such surgery.

Free composite grafts of cartilage and two surfaces of skin from the ear for nasal reconstruction were developed independently in the military service in 1943, and the first illustrations of successful use were published later.†

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*This military work was done in association with Doctors Bradford Cannon, Andrew Moore, W. B. Davis, Carl Lischer, Allyn McDowell, James Grady, Joseph Murray, Milton Edgerton, James Jenson, Park Scarborough, Donald Saunders, Wallace Reed, Byron West, Henley Miller, LeRoy Peterson, William Smith, Walter Graham, David Robinson, Eugene Bricker, Edwin Shearburn, Stephen Chasko, David Fisher, John Gallager, James Grecar, Elliot Randolph, and many other officers, nurses, and corpsmen in the medical and dental corps, and many loyal civilian workers.

The photographs, casts, and art work have been produced and preserved by Miss Virginia McCall, Mr. Kenneth Hoser, and their associates. Our debt and respect goes to the many other surgeons who cared for these patients as they came through other echelons.

†Brown, J. B., and Cannon, B.: Composite free grafts of skin and cartilage from the ear, *Surg., Gynec. & Obst.*, 82:253-255, 1946.

Brown, J. B., Cannon, B., Fisher, C. F., Davis, W. B., Moore, A., and Murray, J.: Further reports on the use of composite free grafts of skin and cartilage from the ear, *Plast. & Reconstruct. Surg.*, *1*:130-134, 1946.

Brown, J. B., and Cannon, B.: Composite grafts of two surf[aces] ... the ear, *Ann. Surg.*, *124*:1101-1107, 1946.

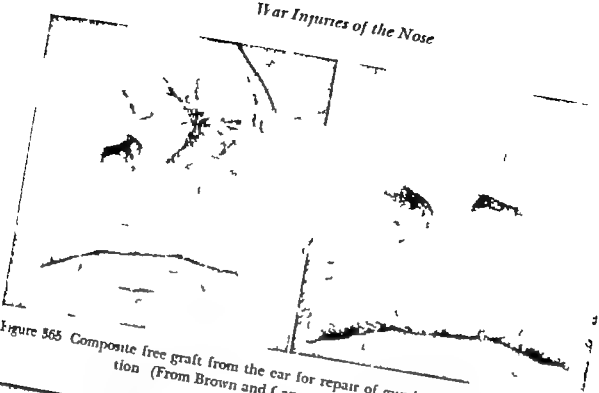

Figure 365 Composite free graft from the ear for repair of gunshot wound Single operation (From Brown and Cannon *Ann Surg* 1946.)

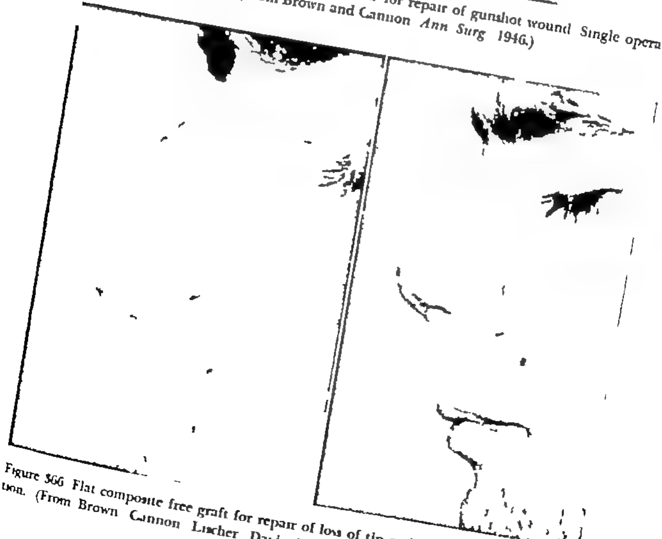

Figure 366 Flat composite free graft for repair of loss of tip and columella single operation. (From Brown Cannon Lischer Davis, Moore and Murray *Plastic & Reconstr Surg* 1946.)

These grafts are used for the alar border, tip, columella, and flattened areas elsewhere, they produce the best repairs and are done in the shortest space of time, with a single operative procedure An example of a major repair of a gunshot wound in one procedure is shown in Figure 365, and a tip and columellar repair by a flat composite graft with one layer of skin is shown in Figure 366 This composite graft with cartilage support was found most adaptable, and was found to be preferable to grafts from the lobe, which did not contain supporting cartilage A subsequent report on their use was made by Dupertuis

The composite graft gives the best restoration of burned ala, and with a free, supraclavicular full thickness graft for the flat surfaces, total nasal resurfacing may be done with a resulting appearance that is superior to a pedicle flap covering (Fig 367)

Supraclavicular full thickness grafts for function and color in face and nose repairs were reported from Army Service, as were composite grafts *

Figure 367 Burn of nose in member of Air Force, repaired with free full thickness graft from neck in one operation and composite free grafts from the ears for the ala Ears were used before their burns were repaired (From Brown and Cannon *Ann Surg*, 1946)

*Brown J B and Cannon, B Full thickness grafts from the neck for function and color in eyelid and face repairs, *Ann Surg*, *115* 639 643, 1945

Figure 368 Burn of nose in member of tank crew repaired with free graft from neck, single operation, and all four eyelids repaired with free grafts from the ear Patient also lost one leg He has made superior rehabilitation and is nationally known author From Valley Forge Hospital.

These grafts are soft pliable and give good function and color They may be a little red if the neck is red or if the face is very white but the color is usually the best of any graft. This graft may suffice for full coverage of a burned nose in one operation (Fig 368) The nostril borders if elevated may be gently dissected downward as much as one centimeter and the restoration completed, or free composite grafts may be added for the ala if needed (Fig 367)

For almost natural color matching the patient in Figure 369 is an excellent example of total resurfacing with this free supraclavicular graft in one operation

Permanent pigment injection is mentioned in conjunction with the patient in Figure 369 to call attention to the natural color of the supraclavicular graft on the nose and the noticeable white grafts on the lip which were

taken from the leg These two lip grafts have had permanent pigment injection by Gertrude Hance (who is coauthor of the first paper on this process in 1944), and the improved color-matching of the lip is shown in the second illustration, along with the natural color of the nose graft from the neck *

Figure 369 Burn in member of Air Force, with ideal color match of free neck graft covering whole nose, single operation From Valley Forge Hospital

This method of coloring grafts and flaps may be applied to nose flaps and grafts if they remain too white There is a question of the permanency of the pigment, for, as in all tattoos, fading may occur

Burns of the nose are part of the "standard" burn sustained in the Air Force and Tank Crews, as they are for prolonged or confined burning from any cause

In confined gasoline burns, the nose, eyelids, ears, face, and hands suffer most, and total resurfacing and extensive reconstruction may be necessary Free full thickness grafts from the clavicular region, with or without free composite graft from the ear, will suffice for resurfacing noses in most instances, and are superior to any flap that can be used (Figs 367, 368, and 369)

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*Brown, J B, Cannon, B, and McDowell, A J Permanent pigment injections of capillary hemangiomata, *Plast & Reconstruct Surg*, *1* 106, 1946

In free skin graft versus pedicle flap resurfacing the selection is dependent on the extent of destruction at the tip When flaps are used for resurfacing without loss of supporting structure, these should not be classified as total nose reconstruction

Free thick split grafts from below the breast and then from the thigh are next in order of usefulness with the greatest number being taken from below the breast. The graft is taken with the suction retractor or dermatome and gives as adequate coverage as the neck graft, but not as good color The Air Force pilot in Figure 370 shows typical loss of lids ears and nasal skin With the healing of the nose that is present, the question may arise Why do a resurfacing? This is easily answered because of the discomfort of the scar the poor reaction to high and low temperatures and because even slight trauma may produce ulceration and further discomfort. The same is true of glazy distorting scars on the ears.

Pedicle flap restorations are necessary in repair for loss of the whole tip of most of one side or of course for total loss In severe burns and extensive gunshot wounds the forehead may not be available as a donor site and

Figure 370. Typical Air Force burn requiring resurfacing of whole nose to replace unstable scar epithelium. One operation with free skin graft Reconstruction also of both ears and all four eyelids. Cared for at Valley Forge Hospital.

A *B*

C *D*

Figure 371 Burn in member of Air Force, with extent of destruction requiring arm flap repair Complete rehabilitation by patient's own efforts in insurance field Cared for by Dr A M Moore, Valley Forge Hospital

distant flaps are used from the neck or arm The typical Air Force destruction in Figure 371 requires a flap repair which is done with the arm as the donor site. The method is outlined in the chapter on total nose reconstruction and in the following paragraphs for total reconstruction

Flaps used for resurfacings and tip reconstruction usually do not need cartilage or bone transplants because there is sufficient framework left for support.

TOTAL NOSE RECONSTRUCTION WITH ARM FLAP

Forehead flaps are generally indicated, as outlined in the chapter on that subject but the forehead may not be available if there are burns or gunshot wounds if it is too narrow or if cutting into other features is to be avoided, and this is of importance in young soldiers who already have had extensive damage. The selection of flaps is important according to the operator but with good success the arm flap may approach the forehead flap in appearance.* Arm flaps are of course more difficult than forehead flaps

D

Figure 371D Use of arm flap retrograde flat not tubed (in a similar repair)

* Brown J B and Cannon, B., Repair of major facial injuries, *Ann Surg.*, *1* 6:520-632, 1947

The arm flap is a retrograde flat one with base distal, outlined on two sides and undermined and resutured at the first stage, without tubing The proximal end is cut across a few days later and closed The flap should be 10 to 12 cm wide and full bulk maintained until the final adjustment to insure adequate size and nostrils

The flap may be lined with a free graft if indicated, but such lined flaps are not as reliable as those obtained from the upper part of the lining around the nose

The flap is put up when there is no swelling or redness, and circulation seems adequate, which is usually about three weeks, but it can be left longer if other work interferes, or if the condition of the patient indicates that he is not ready for the transfer

The flap is raised carefully and the bed grafted or left open Local anesthesia is important for cooperation of the patient Application is made around the whole area with turning in of any available adjacent flaps to

A *B*

Figure 372 Total reconstruction of nose with arm flap following extensive freezing while serving in Air Force Other injuries include loss of ears most of face, all fingers *C* to *F*, Stages in arm flap restoration of nose *E* shows stage of nose when it is left oversize and long *F* shows final contour of nostrils From Valley Forge Hospital (From Brown and Cannon *Ann Surg*, 1947)

line the upper part. These flaps may be prepared as delayed ones when the arm flap is raised if desired.

Fixation of the flap to the nose is with deep fine sutures and a few in the skin. Adhesive support is used in the most comfortable position with the forearm resting on the head. Light packing is put in the nose and a light pressure splint applied.

The pedicle is cut very long in one to three stages after fourteen days and the cut end is allowed to soften completely before any attempt is made to turn in the nostrils.

When the flap is soft and ready it is opened and thinned, the columella and nostrils are fashioned and as carefully as possible contour is established.

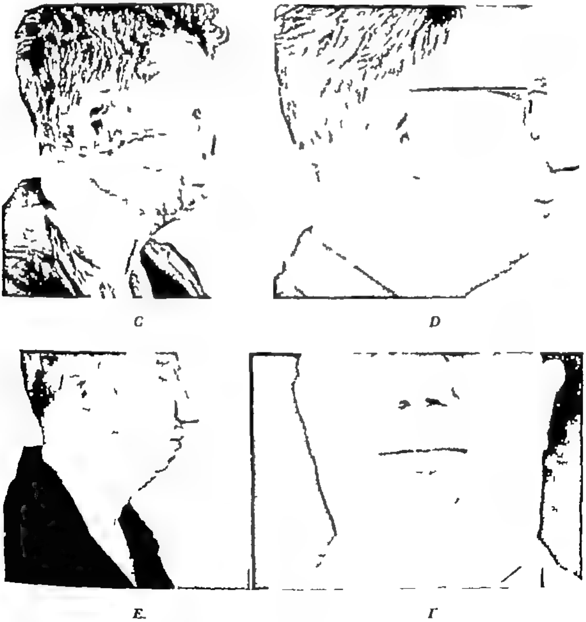


Figure 372 *C* to *F*. For legend see opposite page.

but leaving an apparent excess of tissue At this stage the nose is left long in appearance, to have enough room for a support later

Another wait is necessary for softening, then an L-shaped cartilage or bone transplant is put in through a columella incision This is paradoxical support, however, because it gets its support from the skin, whereas its function is to give stability and contour to the skin and soft tissues

Freezing loss of the nose of a bombardier is shown in Figure 372, with restoration according to foregoing details This excessive destruction of the face has been met with unbelievable fortitude by the patient and his wife, and since his surgical rehabilitation he has studied for the ministry and been ordained His messages from the pulpit are inspiring and with his wife as his vision and spirit, he illustrates the highest possible type of soldier, hero, patient, and desirable human being We who have been privileged to work with such great individuals as this patient are honored to share in a small reflected part of their contribution to the country and to humanity

Blast pigmentation involves the nose, as well as other parts, and there may be blindness There also may be burning and this may obscure the pig-

Figure 373 Pigmentation and heat injury Repaired by scrubbing débridement and small free graft in one area From Valley Forge Hospital

mentation or tattoo of particles in the skin Early cleansing and scrubbing are important, but if there is deep deposit abrasion of any kind may not suffice and discoloration will remain (Fig 373) Later when there is healing wire brush scrubbing, scalpel sandpaper or other form of abrasion may be efficacious for superficial light stains and isolated stains and deep foreign bodies may be excised and the wounds closed or left open But for black deep discoloration excision and grafting as described for burns may be indicated and very worth while results obtained Too deep abrasion may leave glazy and even distorting scar

GUNSHOT AND SHELL FRAGMENT WOUNDS

Partial restorations of the nose are done with free grafts and composite as often as possible but for gunshot wounds of a deep creasing nature pedicle flaps and cartilage or bone for support are used (Fig 374)

Total gunshot wound losses are repaired as outlined previously with arm flaps or as in the chapter on total nose reconstruction with forehead or neck flaps and as illustrated under Plaster Casts for Record (Figs 378 and 379)

Figure 371 Creasing gunshot wound of nose repaired with arm flap (to avoid cutting into other features) and cartilage transplant. Patient cared for by Dr C. E. Lischer at Valley Forge Hospital.

Protheses for loss of noses are used occasionally as a temporary measure, but there is little indication for permanent wearing of one, as surgical restoration usually can be accomplished well enough Protheses are ideal in some instances but most patients will prefer a surgical result rather than the bother of a permanent prosthesis

Cartilage and bone transplants for support and contour are necessary frequently (Figs 374 to 377) Preserved cartilage, used in any instance of possible unsatisfactory result, always can be discarded and replaced, but fresh bone or cartilage is too cumbersome to use except in definitely clean instances where satisfactory result may be insured *

Figure 375 Crushing depression of glabellar region following air crash Repaired in one operation under local anesthesia with preserved cartilage From Valley Forge Hospital

Synthetic subcutaneous prostheses of permanent retention will be a great stride forward, but so far large enough series over long enough periods have not been recorded for general use of these foreign bodies

Defects of the glabellar region and forehead are filled with preserved

* Brown, J B, and DeMere, M Establishing a preserved cartilage bank *Plast & Reconstruct Surg*, *3* 283 293, 1948

cartilage if there is not a pulsating wound. Such repair of course depends on an intact covering and freedom from infection Pulsation means complete loss of bone over the dura and makes a neurosurgical problem of whether bone or metal is needed. If correction is done on plastic services and if contour is important it may be best to use autogenous bone so that it can be trimmed later if needed. Metal cannot be changed in shape once in place and this region is difficult for fitting The patient in Figure 375 retained the posterior wall of the sinus and had no pulsation so repair could be done in a single operation under local anesthesia using preserved cartilage or bone chips as desired.

Air Force, Tank and Traffic crushes and compound injuries involve all degrees of fracture crush laceration and avulsion The general rules are applicable of early evacuation and operation closure of soft parts replacement and support of bones as directly as possible

Nasal wounds and crushes require establishment of the airway pulling the nose up out of the face or replacing it from a deviated position in the direct manner of doing the reverse of what the accident did. The wounds are not packed open and no wide cutting débridements are done There is no extra tissue in the nose and survival of its tissue is remarkable. No primary gas gangrene develops here and débridement consists of cleanliness getting rid of hopelessly dead tissue and scrubbing out stains. Bone chips are discarded sparingly and the badly fragmented bony nose may have to be mulched into position and held with packing wires and splints

Firm pressure fixation dressings are needed and splints can be of any available light metal peanut cans for example cut to design

Sutures should be fine and not wide Deep closure of key spots is best the edges being held together with tiny sutures or even with adhesive It has been observed that regular military equipment may not include any needles or sutures suitable for such work and a wary officer can equip himself with a few small suitable needles and fine silk sutures Fine wire such as Surgaloy may be of great value

Crushes and tears versus gunshot wounds The element of difference is that in the crushes of aircraft, tanks and traffic, the tissues may be completely displaced but they are usually all there and can be sorted out and returned to position while gunshot and shell fragment wounds explode the bones and tear away bone and soft tissue so that there may be no chance of closure in normal position and contour

Association with other injuries is almost certain to occur such as middle third fractures transverse facial separations, pyramidal depression zygomatic and orbital displacements plate separations lacrimal tearing cribriform plate opening brain and skull damages and blindness from bone fragment injury of nerve or direct injury of the globe These added elements are recorded before operation including all cranial nerve functions.

Secondary repairs of crushes require knowledge of osteoplastic procedures and it is for these war injuries that patients who have contributed to surgical knowledge and experience may feel that they have helped, even though the torn or blasted nose is far from the repair of some unpleasant deformity in civilian life Before the osteoplastic procedure there may be required complete reopening of misplaced soft tissues and correct alignment of them This procedure then must be firmly healed before deep bone work or grafting is done because here, as elsewhere, th dictum is true that "deep healing can be no better than the surface healing"

Figure 376 Complete transection and displacement of nose following Air Force crash There was so much elevation of the middle third of the face following overhead traction that an upper set of teeth had to be made for the upper jaw Repaired by complete revision and replacement of nose and cartilage transplant From Valley Forge Hospital

There is no extra tissue in the nose usually, and excision and pulling edges together are seldom indicated, nor is repeated partial excision of scars

Crushes may be reset up to two weeks and possibly there may be some improvement if done even up to six weeks if the old fracture lines can be forced open But later than this, displaced bone and cartilage blocking the airway are replaced or removed, and secondary support is put in if neces-

sary usually at a later procedure The patients in Figures 376 and 379 have had complete revision of scars and secondary build up with cartilage or bone in the nose and in the orbit.

Caution must be used not to overelevate middle third features because fractures do not all drop down—some of them collapse upward in the antra with the dental arch and nasal spine actually elevated. In these the middle third needs elongation rather than elevation and the nasal spine needs to be pulled down out of the nose and wired to teeth if necessary The patient in Figure 376 had upward collapse that was of course not relieved by over head traction so that an extra set of teeth over his own arch had to be used to give a semblance of occlusion and an approach to normal appearance of the middle third

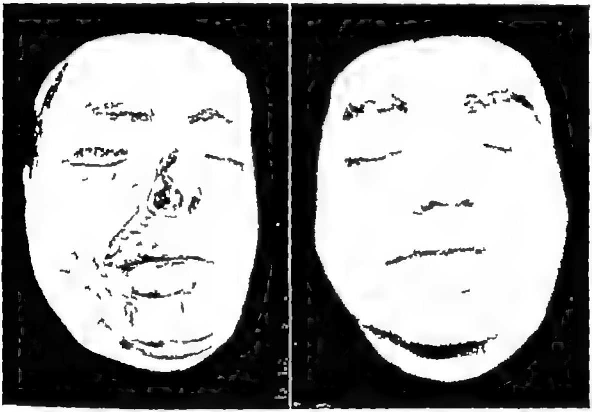


Figure 377 Severe facial loss recorded permanently in plaster Repair with arm flap for the nose and free grafts for the face Cared for by surgeons listed in footnote at beginning of chapter

Plaster casts for permanent record and for study made by Virginia McCall illustrate their great advantage as the most lifelike records (Figs 377 and 378) These are taken in plaster or wax the positive made in plaster and colored and they may be counted as the most permanent war record of these injuries

RESULTS OF MILITARY RECONSTRUCTIVE SURGERY OF THE NOSE—PATIENTS' REACTIONS AND ATTAINMENTS

Too high praise cannot be given these wounded individuals for their great sacrifice and heroism, and for their unbelievable cooperation and appreciation during their surgical rehabilitation

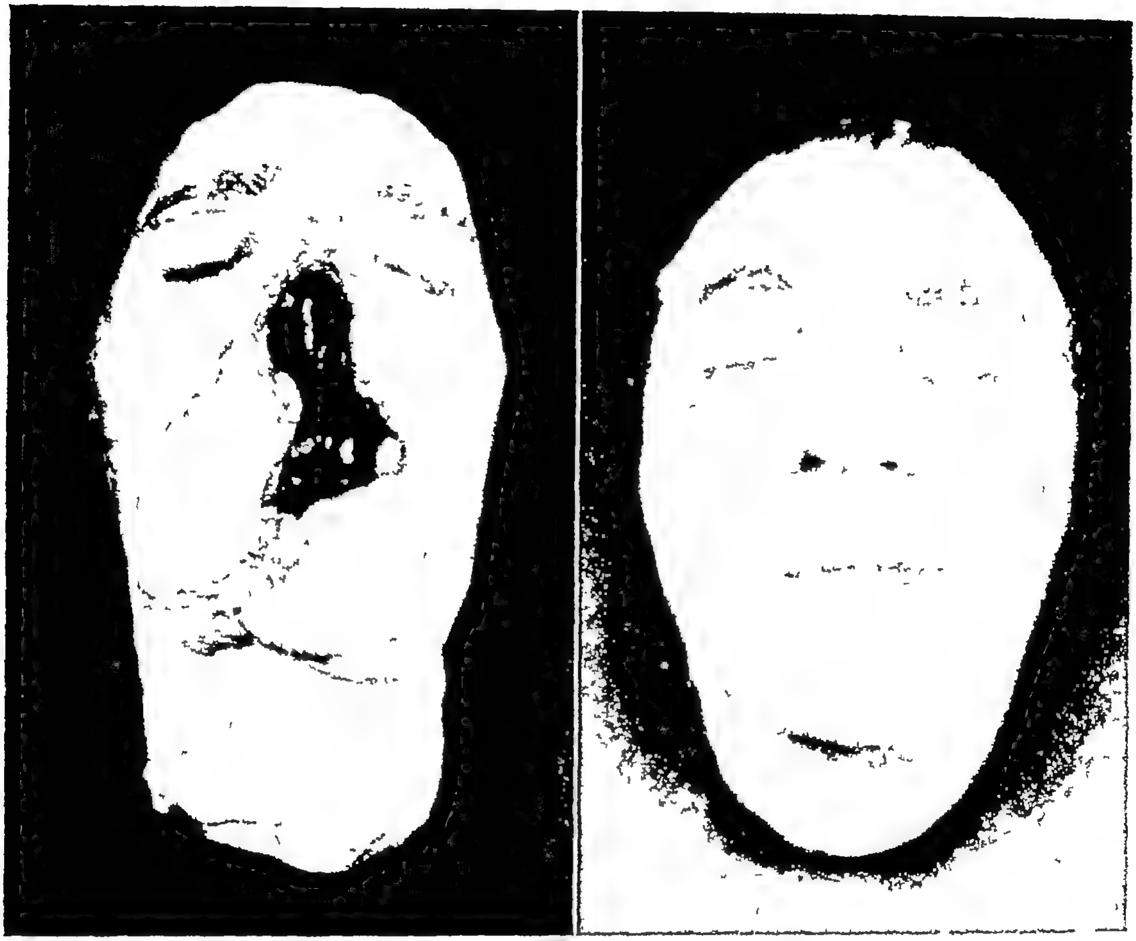


Figure 378 Plaster cast records of severe injury by Virginia McCall Restoration with chin and jaw reconstruction with permanent pedicle flap from the neck and with arm flap for the nose (From Brown and Cannon *Ann Surg*, 1947 Photographs in chapter by Mr Kenneth Hoser)

Hundreds of these patients with other wounds, with blindness, and with amputation have attained normal full lives, with marriage and the development of families Studies and work have been pursued and careers independent of outside help have been established Wives have been of great inspiration and, though suffering along with the patients, they have guided their children into normal acceptance of their father so that such added deformities as blindness and loss of both hands have not caused any untoward reaction

These patients have never relied on their defects for alms or advantage and none have developed antisocial conduct. That they can lead normal lives is attested by their records of work in all professions skills and businesses. They have gone from the hospital to schools of divinity law medicine dentistry engineering arts and mechanics They have become executives authors salesmen insurance authorities public servants naturalists and actors and have excelled in sports

Figure 379 Extensive tearing and displacement of nose along with depressed orbit following air crash. Complete revision of nose and lip scars, repositioning of nose, and final cartilage transplants to nose and orbit From Valley Forge Hospital

Perhaps above all they have not griped One who wrote his story with his wife presented it to a national magazine without title The editors after reading it labeled it simply Fortitude not even knowing he had gone through twenty three operations without so much as an ouch (Fig 372)

These men s forthright acceptance of their fate and their humble determination in their own rehabilitation into normal lives and endeavor are inspiring in noble human worth and dignity of the individual

Chapter XXIX

SYNTHETIC IMPLANTS

In Chapter XII, it was noted that plastic implants might be ideal when one could be found to be permanent in a large series of patients This goal has not been completely achieved yet, but synthetic implants have been inserted in the noses of many patients, most have remained in place for several years without trouble, and their further use seems indicated in selected instances

This work has been made possible by fifteen years of careful experimental and clinical work with our colleagues—Dr Minot P Fryer, Dr David A Ohlwiler, Dr Peter Kollias, Dr Andrew M Moore—and by excellent co-operation from the manufacturers and developers of these materials A list of publications describing this work is appended to this chapter

Figure 380 (*Left, center*) Appearance after insertion of L shaped preserved cartilage through columella Restoration required for breathing (had loss of septum from trauma and operation) and for work as professional singer (*Right*) Same patient nine years later

Preserved cartilage is still used in a substantial proportion of patients (Figs 380-381), with autogenous cartilage, bone, or various synthetics being used in others In some instances, a primary build-up is done with cartilage or bone and at a later operation an overlay is done with one of the other materials, or both may be put in at the same time There is no one substance which has a uniform superiority over the others, each has specific advantages

Figure 381 Preserved cartilage implant, shown at bottom after eleven years. Has now been in place, in satisfactory condition for eighteen years. If absorption does occur could have substitution with silicone or another cartilage

and disadvantages; considering all of these, it is important to select the material that is best for the patient at hand (Figs 382-383)

In searching for an ideal implant material, the criteria have been (a) it should be inert, not subject to leaching or other physical or chemical changes throughout a long period within the human body, (b) it should not be antigenic nor carcinogenic, nor unduly increase the susceptibility to infections within its locus, (c) it should stay where it is put, (d) it should be susceptible to shaping with ordinary surgical tools, and should maintain that shape and size unchanged afterwards, (e) it should be susceptible to complete sterilization by ordinary methods, (f) it should possess physical properties similar to the tissue which it is replacing—a hard material for bone, a rubbery one for cartilage, and a soft one for fat All of these objectives have not been attained, but the silicones and Teflon fulfill a good many of them in individual instances The specific materials to be used will change as rapidly as better ones are developed and proved by experimental and clinical use

The first step with a patient is determination of the necessity or advisability of using a transplant or implant, an alternative method will be better in some instances (Chapter XI) If a transplant or implant is re-

Figure 382 L-shaped silicone rubber implant Same patient is shown in Figure 201 Insertion of increasingly large L-shaped transplants of preserved cartilage at ages of six, ten, and fourteen years resulting in normal growth of soft tissues of nose There was some absorption of last one, so patient desired the final restoration to be silicone

quired one must next delineate its correct shape and size after which comes the selection of the best material for use in this specific case If an implant is chosen (rather than a transplant) it will be especially important to thoroughly and properly prepare the bed at operation as described in Chapter XII, complete postoperative care will likewise be essential for success. The mistakes that come in for secondary correction are often the result of spending too much time on selection of this or that material and too little on the other points described in this paragraph Such patients may

Figure 383 Severe facial crush entire middle third moved backward and upward. Initial restoration was *with preserved cartilage which absorbed in three years. This was replaced* by L-shaped implant of silicone rubber which is shown on the right six years later

display implants that are the wrong shape or size, or too loose, or poorly placed, or infected, or inserted when not needed

PRESERVED CARTILAGE

Preserved human rib homocartilage is a satisfactory material for many nasal transplants, and after a period of increasing use of implants, there may be a swing back to more use of it Cartilage can be carved into exactly the shape desired, more easily and better than other materials It is inert, has reasonable strength, and doesn't feel as hard in the nose to the patient as most of the other materials

There are two principal disadvantages of preserved cartilage (1) In a minority of patients, there will be varying degrees of late absorption or shrinkage, occasionally to the point of disappearance (Fig 383) This may be more frequent with the freeze-dry preparations, than with those kept in a merthiolate-saline solution in a well run bank With the latter, most transplants persist over long periods of time with little evidence of change (cf Figs 380-381) (2) Obtaining the cartilage from postmortem sources, and maintaining a good bank, using merthiolate-saline preservative with constant temperature of 4°C and regular negative cultures, is a continuous chore necessitating constant attention and care Nevertheless, preserved cartilage has so many good qualities, and has exhibited them so long, that it is still the standard against which other materials must be measured

AUTOGENOUS CARTILAGE

Autogenous rib cartilage warps too frequently in our experience for routine use in the nose (there have been reports by Gibson and others of methods of cutting the cartilage to diminish or obviate this, which may be useful) It may, however, be the material of choice to put in the orbit with a good eye, to fill in a skull defect over dura, for the reconstruction of adult ears, and in some other locations It has some ability to recover from minor infections, when properly treated, and shows little or no late absorption

Little pieces of autogenous cartilage from the lower laterals, or occasionally from the septum or the back of the ear, are sometimes useful in a rhinoplasty A good method to "sharpen the nasal tip" in some patients is to transplant a small elliptical piece (about 3-4 mm x 8-10 mm) of lower lateral cartilage as a free graft into the extreme tip of the nose, right under the skin in the midline Occasionally, it will be necessary to tack two pieces together with a 000 white silk stitch, if the cartilage is very thin The graft is introduced at the end of the operation (eversion technique) by hooking a vertical crus down and out, inserting the graft in position with a curved mosquito forceps, replacing the vertical crus, inspecting for final correct

ness of size and position packing and splinting the nose A broad spectrum antibiotic is administered systemically for a few days and results have been worthwhile This maneuver is helpful for final correction of a flat tip especially those encountered in some secondary operations

By contrast septal cartilage is generally not as useful On occasion reverse deformities are seen when someone has removed a warped septal cartilage turned it around and reinserted it.

AUTOGENOUS BONE

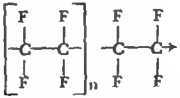
Autogenous bone takes well if in contact with bone at the glabella or root above and the maxilla below it probably has the most strength of anything used in the nose (Fig 183) However iliac donor sites may cause considerable pain and morbidity An additional problem is that even with great care it is not possible to carve bone transplants as precisely as cartilage Finally a bony tip feels bony hard to the patient forever every time he touches it every time he smiles This is objectionable to some patients

TEFLON

Both Teflon and the silicones have undergone extensive investigation on our service (700 small animal implantations with laboratory studies) and have been used clinically for some years (Figs 382 through 390)

They have the following advantages (1) are easy to procure (2) require no other operations or bank storage (3) may be shaped as needed (4) are probably not antigenic (5) cause minimal tissue reaction (6) are homogenous and do not warp or break if designed properly (7) do not erode or calcify or bend as cartilage may (8) are inexpensive and (9) can be repeatedly sterilized and used secondarily

Teflon (DuPont) is a long chain polymer of tetrafluorethylene with the following basic formula



It is made by polymerization of tetrafluorethylene gas at high temperature and pressure is chemically inert with no known solvents and stable from −195 to +326 C. It is one of the group of fluorocarbons (from the larger family of halogenated carbons) These synthetic combinations of inorganic and organic substances do not occur in nature and they exhibit physical and chemical properties of their own

Teflon is available in blocks of various thicknesses sheets rods linters and sponge The block material is hard and shows the least surrounding re

action in tissues We have seen no tumors develop from it in laboratory animals or in clinical use

For clinical use in noses, a 1/4 inch or 3/8 inch thickness block of Teflon is selected It is a hard white solid Before sterilization, it is cleaned with ether or acetone, soap and water, being sure to get off all talcum, Bio Sorb and fingerprints Autoclaving is done last after the cleaning

The implant is carved to the shape and size required for the patient at hand, as determined by pre-operative workup on a plaster cast, by examination at operation of the dimensions of the prepared recipient pocket, and by the tightness or looseness of the overlying skin. The carving is done on a sterilized smooth hardwook block (e g , 2" × 6" × 6" size), using #10 and #15 scalpels The material is so hard that the carving is slow and difficult, and there may be trouble with blades breaking in the process This is one of the disadvantages of Teflon Bone instruments wood-carving tools, small manual or power saws, and ivory-carving tools may be tried, but the carving remains slow and difficult with some potential danger to the surgeon's hands For gross molding, Teflon may be heated to 270° C - 300° C and bent, after cooling, it will retain the new shape While immersed in water at 95°C, it may be annealed, and this has been useful in preparing jaw implants On occasion, a number of preformed nasal implants of various sizes and shapes have been available, but the nearest larger one to the

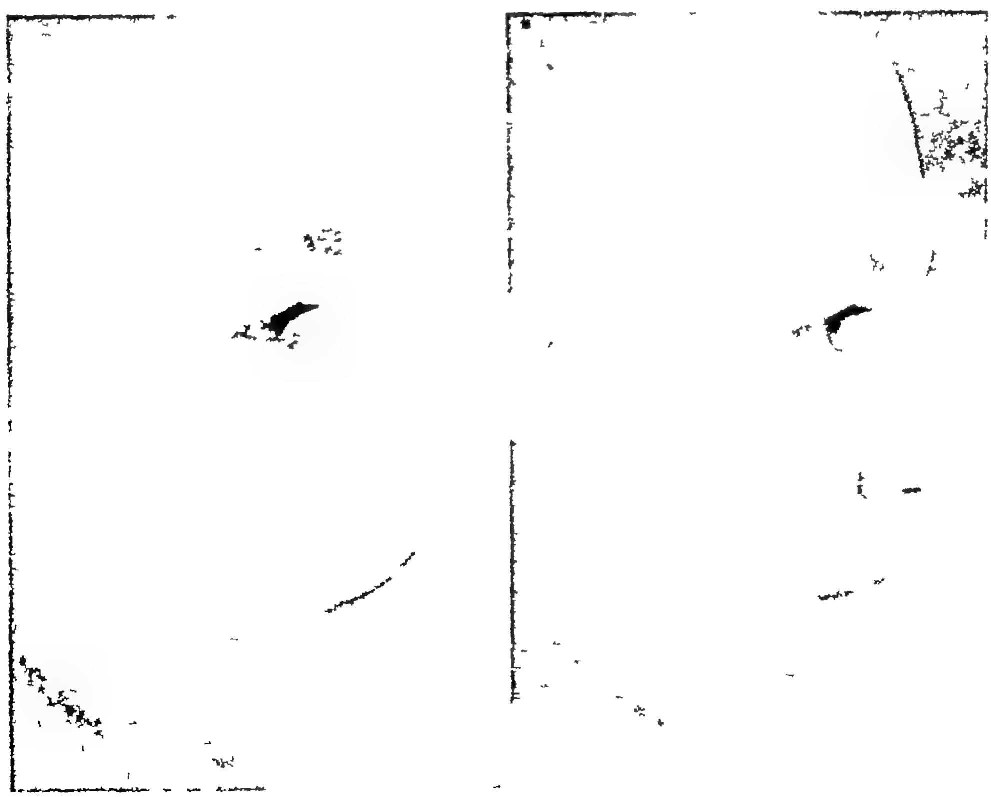


Figure 384 Teflon implant for restora[illegible] om [illegible] athing In place for five years [illegible] ple[illegible]

actual requirement still necessitates considerable carving and fitting to get the best result.

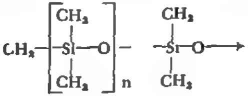
In implanting a material as hard as Teflon it is important to round off all edges and to avoid thin or sharp edges corners or prominences otherwise there is a possibility that they may later cut through the skin or mucosa and extrude For the same reason it is well to not stretch the skin or mucosa over any part of the implant and to secure a thick closure of soft tissue in the columella inferior to the implant. The latter is accomplished with 000 white silk sutures in the subcutaneous layer with 0000000 black silk sutures for the skin

Teflon is extremely inert when used in properly selected cases it will give support and improved shape to the nose for many years perhaps indefinitely (Figs 384 385) As with bone there is a feeling of hardness to the patient he should understand this beforehand and indicate that it will be acceptable to him Because there is only a suggestion of a capsule developed around Teflon implants fixation will depend upon the surgeon rather than tissue growth Finally these implants do not tolerate infection and should not be used where this is likely to be a problem

SILICONE

The silicones are a group of materials which may be liquid resin or solid they are polymers of dimethyl siloxane The viscosity increases as the chain is lengthened from a thin liquid to putty like resins (Fig 386)

The dimethyl siloxane radical is the basic unit and is shown below



This may be polymerized several thousand times in forming the various long chain polymers that are of clinical use The end groups may be methyl or hydroxy radicals

The viscous liquid types were used in early experiments on our service and although these were inert to body tissues and fluids they tended to gravitate to dependent areas they had no intrinsic permanent form and assumed the shape of their confines in other words they remained liquids.

The term *Silicone* was coined by F S Kipping in Nottingham England but he apparently thought that the synthetic had only academic interest.

A silicone rubber has been produced for medical uses by Dow Corning and invaluable help has been given by Silas Braley and R R. McGregor in this work. The rubber is produced from a viscous highly polymerized dimethyl-siloxane which is heated with fine pure silica and a vulcanizing

action in tissues We have seen no tumors develop from it in laboratory animals or in clinical use

For clinical use in noses, a ¼ inch or ⅜ inch thickness block of Teflon is selected It is a hard white solid Before sterilization, it is cleaned with ether or acetone, soap and water, being sure to get off all talcum, Bio-Sorb, and fingerprints Autoclaving is done last after the cleaning

The implant is carved to the shape and size required for the patient at hand, as determined by pre-operative workup on a plaster cast, by examination at operation of the dimensions of the prepared recipient pocket, and by the tightness or looseness of the overlying skin The carving is done on a sterilized smooth hardwook block (e g , 2" x 6" x 6" size), using #10 and #15 scalpels The material is so hard that the carving is slow and difficult, and there may be trouble with blades breaking in the process This is one of the disadvantages of Teflon Bone instruments, wood-carving tools, small manual or power saws, and ivory-carving tools may be tried, but the carving remains slow and difficult with some potential danger to the surgeon's hands For gross molding, Teflon may be heated to 270° C - 300° C and bent, after cooling, it will retain the new shape While immersed in water at 95°C, it may be annealed, and this has been useful in preparing jaw implants On occasion, a number of preformed nasal implants of various sizes and shapes have been available, but the nearest larger one to the

Figure 384 Teflon implant, for restoration of nasal contour, support, and breathing In place for five years now, with no complications

actual requirement still necessitates considerable carving and fitting to get the best result.

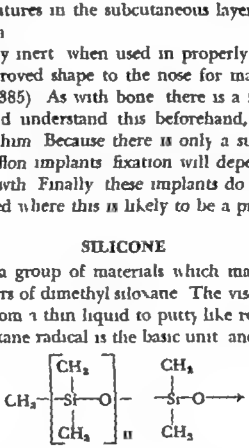
In implanting a material as hard as Teflon, it is important to round off all edges and to avoid thin or sharp edges, corners, or prominences; otherwise there is a possibility that they may later cut through the skin or mucosa and extrude. For the same reason, it is well to not stretch the skin or mucosa over any part of the implant, and to secure a thick closure of soft tissue in the columella inferior to the implant. The latter is accomplished with 000 white silk sutures in the subcutaneous layer, with 0000000 black silk sutures for the skin.

Teflon is extremely inert; when used in properly selected cases, it will give support and improved shape to the nose for many years, perhaps indefinitely (Figs. 384, 385). As with bone, there is a feeling of hardness to the patient; he should understand this beforehand, and indicate that it will be acceptable to him. Because there is only a suggestion of a capsule developed around Teflon implants, fixation will depend upon the surgeon rather than tissue growth. Finally, these implants do not tolerate infection and should not be used where this is likely to be a problem.

SILICONE

The silicones are a group of materials which may be liquid, resin, or solid; they are polymers of dimethyl siloxane. The viscosity increases as the chain is lengthened from a thin liquid to putty-like resins (Fig. 386).

The dimethyl-siloxane radical is the basic unit, and is shown below:



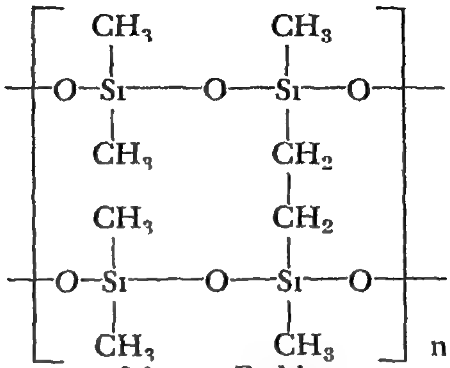
This may be polymerized several thousand times in forming the various long chain polymers that are of clinical use. The end groups may be methyl or hydroxy radicals.

The viscous liquid types were used in early experiments on our service, and although these were inert to body tissues and fluids, they tended to gravitate to dependent areas; they had no intrinsic permanent form and assumed the shape of their confines; in other words, they remained liquids.

The term *Silicone* was coined by F. S. Kipping in Nottingham, England, but he apparently thought that the synthetic had only academic interest.

A silicone rubber has been produced for medical uses by Dow-Corning, and invaluable help has been given by Silas Braley and R. R. McGregor in this work. The rubber is produced from a viscous highly polymerized dimethyl-siloxane which is heated with fine, pure silica and a vulcanizing

agent, benzoyl peroxide Hydrogen atoms are pulled out from some of the side methyl groups, resulting in cross linkages between some of the long chain polymer molecules



Silicone Rubber
S9711
(Silastic)

It is interesting that the change in physical qualities is brought about by even a few such cross-linkages, perhaps between only about 15 out of 10,000 polymerized chains The resulting material is a soft, resilient clear-amber material which is difficult to distinguish on casual inspection from organic rubber The physical properties are stable from −56°C to +540°C The material has a specific gravity of 1 13 and is fairly easily sculptured or cut with a sharp scalpel (about like carving a block of rather soft rubber) The

Figure 385 L-shaped Teflon implant, used for correction of secondary cleft lip nasal

product developed for medical use is free of any leachable material or particles and has sufficient rigidity to support noses that could be held forward with cartilage

Figure 386 Silicone implant for correction of underdeveloped jaw and chin of congenital origin Patient's reaction before and after correction notable in unposed photos. Implant in place for six years.

The silicone rubbers have been produced in slightly different grades and the soft rubber seems to be the best for L shaped nasal implants (Figs 387 390) Blocks of 1/4 and 3/8 thickness are cleaned and sterilized for use At operation the size and shape of the implant is determined and it is carved out of a block of appropriate thickness Again a hard wooden platform and #10 and #15 sharp scalpels are used to carve the silicone rubber a sawing motion of the knife is often preferable Any sharp edges are rounded, but it is not so essential here as with a hard material (e g Teflon)

If a satisfactory bed is prepared, with sufficient soft tissue covering at all points and no infection lurking in the vicinity, there should be no particular difficulty in getting a good take. A number of such implants have been in now for periods of five to seven years with no apparent change, and it is thought that they will be permanent.

Relative tissue reactions of Acrylic, Silicone rubber, and Teflon can be seen on inspection of laboratory implants. Acrylic rods left in a guinea pig for three months were found surrounded and eroded by a dense cicatrix. By contrast, pieces of Teflon buried subcutaneously for over a year were found to have minimal surrounding reaction and no change in the implants. The same is true of silicone and this has also been verified by subsequent operations on patients in which silicone rubber implants have been inspected after periods of a few months or years. However, if silicone rubber is used to distend a small soft tissue pocket in the nose or ear, the effect the first few weeks may be good, but there may be later shrinking of the tight overlying skin, with redness, thinning and atrophy, and eventually exposure and loss. For this reason, the soft tissue coverage should initially be as thick as is available, and should not initially be placed on too much stretch by the implant.

Figure 387. L-shaped silicone rubber implant, for restoration of nasal contour and support. Bony hump removed to provide smooth platform for implant, and to make room for upper end of it.

Silicone implants tolerate infection poorly Occasionally one can be saved by incision and drainage trimming down any prominence of the implant and using systemic and local antibiotics usually however removal will be required to get healing In such instances another implant or transplant (the latter should be considered here) should not be inserted until the area has been healed and quiescent for three months or more

Silicone rubber L-shaped implants in the nose feel harder to the patient than a normal nasal tip but not so hard as Teflon or bone. Except for the items noted above the nose or the implant does not seem to change over the years patients have been well pleased with them In rare instances, there have been late infections—presumably initiated by trauma or possibly by bacteremia

SYNTHETIC SPONGES

The principal sponge materials being used at present are silicone sponge (Dow Corning Co) di isocyanate (Etheron Robbins Co) and polyvinyl alcohol (Ivalon Clay Adams Co) sponge

Silicone sponge is light yellow in color light in weight, and soft either when wet or dry Etheron is likewise soft wet or dry light in weight (perhaps the lightest) and is white in color (sometimes yellowish after sterilizing) It is a di isocyanate.

Figure 388 L shaped silicone rubber implant used primarily to hold lower nose forward and restore nasal airways.

The polyvinyl alcohol surgical sponge is white, odorless, light, and has the appearance on its cut surface of a slice of bread Dry, the sponge is hard and rigid Moist, it is soft and resilient, readily resuming its original shape after being compressed, and is quite easily cut and shaped with knife or scissors

Figure 389 Total loss of nose, central forehead and part of eyelids from traffic accident New nose built from lined arm flap, skeletal support, L-shaped silicone rubber implant

The need for a soft subcutaneous prosthesis is great, especially in locations other than the nose All of these sponges seem to be quite inert when implanted into experimental animals, or into patients, are easily cut and shaped with knife or scissors, and in the early post-operative period feel fairly soft However, they are soon ingrown by connective tissue, which later contracts and hardens to change the character of the implant, in our experience, this effect has seemed the greatest in polyvinyl alcohol sponge and in decreasing order in di-isocyanate sponge and silicone sponge When using any of these sponges, it is necessary to insert initially more volume than is desired for the final result In some instances, there will be fluid collections around the implants within a few days, with rigidly sterile precautions, these may be aspirated from a distant point, pressure dessings applied, and broad spectrum antibiotics given systemically After a few aspirations (at intervals of a few days), the size of the implant plus fluid may reach a more or less constant state, without much fluid and without signs of inflammation, at this time, it may be best to cease aspirations and the fluid may gradually absorb and the implant persist indefinitely thereafter Occasionally, infection will develop and removal of the implant will be necessary, this is difficult, as granulation tissue will have grown through the meshes, and usually it necessitates sharp dissection and excision

The sponge materials are sometimes of use as an overlay material over one of the solid implants or transplants, to smooth out the surface contour,

for such purposes they may be placed primarily or at a later operation Again they are seldom very useful in the nose

COMMENTS ABOUT SYNTHETIC IMPLANTS

Selection In our present state of knowledge it is probably best to consider an autogenous transplant first, perhaps preserved homocartilage second and synthetics third Fresh autogenous transplants should be ideal prosthetic materials but these are not always available or advisable their

Figure 390 Trauma, infection operation L-shaped silicone rubber nasal implant following septal loss from injury and infection. Where a large perforation exists there may be a minimum of tissue in which to make a pocket for the prosthesis. Implant in place for six years.

procurement requires an added operation with added scarring and discomfort for the patient and there may be distortion if autogenous cartilage is used Preserved cartilage is excellent in many instances, but presents difficulties of procurement in some localities, and always the inherent difficulties of maintaining a bank in satisfactory condition The freeze-dry and other commercially available varieties have not been satisfactory for large L-shaped supports, in our experience The synthetics also present some problems, as outlined earlier If used, thought should be given to selection of the proper one for the individual patient Finally, the implant should be custom designed and made for the individual patient at the time of implantation

Operative Details Careful study, diagnosis (which is mainly decision as to what is missing and needed), preliminary measurements, and casts of the defect and surrounding area are of marked help Strictest asepsis is essential Incisions should be away from the implants, if possible, so that the thickest possible soft tissue closure can be obtained over the synthetic Minimal blood collections and accurate closure with careful pressure-fixation dressings are necessary, in the case of the nose, splint protection is used for two weeks

Fluid or Blood Collections may occur in the postoperative period If so, they are aspirated from a distant point, but not by opening a wound directly over an implant

Antibiotic coverage with one of the broad spectrum drugs is used for one week postoperative, or longer if there is suggestion of a fluid or blood collection of inflammation present

Infection is an unusual, but most troublesome, complication The problem is worse with the sponge materials than the solid ones The continuous sponge produces a perfect culture medium of serum, blood, temperature, and with no circulating blood to help Some deep lying sponge implants might withstand infection and drainage, but removal may be necessary and later a second trial may be made

Slipping from position can occur, it may be corrected with trimming and reclosure or may require replacement Replacement is relatively simple with Teflon or silicone rubber, but not for sponge implants

Permanency of any of these synthetic implants is not assured as yet, but seems likely from the period of years that a significant number of them have been in place with no complications The results thus far justify their consideration for further use in many instances New materials will come to attention from time to time, before using them, the surgeon will want to know that they are equally inert, equally safe, equally permanent, and that they have some definite advantage over their predecessors

SHAPE

Though other shapes will be useful in rare instances most patients will get the greatest benefit and most solid support of the nose from a sufficiently large L shaped implant (Figs 175 180) If the upper or mid nose is rounded by a hump enough should be removed with a saw or chisel to provide a flat platform for the dorsal segment of the implant, and to make room for it under the skin Care is taken of course to not penetrate the mucosa at any point so that there will not be any entry point for organisms from the airways A septal pocket of sufficient size is prepared for the septal component of the implant resecting some septal cartilage if necessary The implant should rest solidly on the bony dorsum above and extend down into the columella to the bony maxilla or nasal spine below Its size should be sufficient to get the contour and support desired but there should be no tension on the skin or septal mucosa These requirements are best met by individual carving of the implant after the operative pocket has been prepared and its shape and dimensions are completely known Finally there should be a thick closure of the columellar incision inferior to the implant

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